

**Noxious Weeds Review
of Victoria
Phase 3a
2005–06**

The following publication presents the invasiveness and impact assessments, and present and potential distribution maps for 65 plants identified as potential weeds for Victoria as part of the review of noxious weeds list.

The list is derived from Weeds of National Significance (WoNS) not yet declared as noxious in Victoria, the National Environmental Alert List published by the Department of Environment and Heritage (DEH), and other species nominated by the peak industry body for horticultural trade in Victoria, the Nursery and Garden Industry Victoria (NGIV).

The document is arranged into three sections.

Section 1: Species pages, contains in order of appearance, the invasiveness assessment, present distribution map for Victoria, potential distribution map for Victoria, and the impact assessment for each of the 64 species.

Section 2: Weed scores and rank by CMA, is a series of worksheets for each of the 10 Catchment Management Authorities (CMA). These worksheets, in order, are as follows:

- Score and rank summary for each species for the nominated CMA;
- A comparative list showing the ranking of phase 3a species in relation to phase 1 & 2 species;
- The present distribution and calculation of potential distribution score, and
- The potential distribution by land use type.

Section 3: Additional species from the Victorian Alert Weed List. The assessments for several other species, nominated by the CAS Weed Alert group in DPI as potential environmental weeds, are included. The present distribution of these species is yet to be validated by regional staff and are thus excluded from the main list. The Tackling Weeds on Private Land initiative provided funding for the assessment of these additional species.

While the invasiveness and impact assessments are based on a whole of Victoria scenario, the data presented in the worksheets is relevant only to each respective CMA. This is due to the ratio of present to potential distribution being unique for each CMA and the influence this measure has on the overall score.

The methodology used to assess these plants has been published previously in phase 1, and is available on the CD 'Noxious Weeds Review 2004: Phase 1 Assessment Data' published by the Victorian Department of Primary Industries. Further information on the noxious weeds review process and the methodology used to rank plants is available online at the following URL:

http://www.dpi.vic.gov.au/dpi/vro/vrosite.nsf/pages/weeds_vic_nox_review

Victorian Noxious Weeds Review

Phase 3a species

Common Name	Scientific Name
Cutch tree	<i>Acacia catechu</i>
Prickly acacia	<i>Acacia nilotica</i> ssp. <i>indica</i>
Annual ragweed	<i>Ambrosia artemisiifolia</i>
Lacy ragweed	<i>Ambrosia tenuifolia</i>
Burr ragweed	<i>Ambrosia confertiflora</i>
Pond apple	<i>Annona glabra</i>
Madeira vine	<i>Anredera cordifolia</i>
Chinese violet	<i>Asystasia gangetica</i> ssp. <i>micrantha</i>
Barleria, porcupine flower	<i>Barleria prionitis</i>
Kochia	<i>Bassia scoparia</i> (syn. <i>B. sieversiana</i> , <i>Kochia alata</i> , <i>K. scoparia</i> var. <i>culta</i> , <i>K. scoparia</i> var. <i>pubescens</i> , <i>K. scoparia</i> var. <i>subvillosa</i> , <i>K. scoparia</i> var. <i>trichophila</i> , <i>K. sieversiana</i> , <i>K. trichophila</i>)
Cabomba	<i>Cabomba caroliniana</i>
Heather	<i>Calluna vulgaris</i>
Greater bindweed	<i>Calystegia silvatica</i>
Glaucous star thistle	<i>Carthamus glaucus</i>
Spotted knapweed	<i>Centaurea maculosa</i> .
Siam weed, chromolaena	<i>Chromolaena odorata</i>
Rubber vine	<i>Cryptostegia grandiflora</i>
Blue hound's tongue	<i>Cynoglossum creticum</i>
Cyperus	<i>Cyperus teneristolon</i>
African weed-orchid	<i>Disa bracteata</i>
False yellowhead	<i>Dittrichia viscosa</i>
Senegal tea plant	<i>Gymnocoronis spilanthoides</i>
English ivy	<i>Hedera helix</i>
Hymenachne, Olive hymenachne	<i>Hymenachne amplexicaulis</i>
Large flowered St John's wort	<i>Hypericum calycinum</i>
Canary Island St John's wort	<i>Hypericum canariense</i>
Trailing St John's wort	<i>Hypericum humifusum</i>
Chinese rain tree	<i>Koelreuteria elegans</i> ssp. <i>formosana</i>
Yellow Soldier	<i>Lachenalia reflexa</i>
Lantana	<i>Lantana camara</i>

Common Name	Scientific Name
Miconia	<i>Miconia</i> spp.
Mimosa, giant sensitive plant	<i>Mimosa pigra</i>
Thistle	<i>Onopordum dissectum</i> .
Cotton thistle	<i>Onopordum nervosum</i>
Taurian thistle	<i>Onopordum tauricum</i>
Tiger pear	<i>Opuntia aurantiaca</i>
Parkinsonia	<i>Parkinsonia aculeata</i>
Garden geranium	<i>Pelargonium alchemilloides</i>
Leaf cactus	<i>Pereskia aculeata</i>
Uruguayan rice grass	<i>Piptochaetium montevidense</i>
Praxelis	<i>Praxelis clematidea</i>
White weeping broom	<i>Retama raetam</i>
Giant bramble	<i>Rubus alceifolius</i>
Florida blackberry	<i>Rubus argutus</i>
Keriberry	<i>Rubus rugosus</i>
Arrowhead	<i>Sagittaria montevidensis</i>
Delta arrowhead	<i>Sagittaria platyphylla</i>
Dwarf arrowhead	<i>Sagittaria pygmaea</i>
White willow	<i>Salix alba</i>
Grey sallow	<i>Salix cinerea</i>
Crack willow	<i>Salix fragilis</i>
Pencil willow, Chilean willow	<i>Salix humboldtiana</i> (syn. <i>S. chilensis</i>)
Corkscrew willow, Peking willow	<i>Salix matsudana</i>
Black willow	<i>Salix nigra</i>
Purple osier	<i>Salix purpurea</i>
Osier	<i>Salix viminalis</i>
Weeping willow	<i>Salix x pendulina</i>
Basket willow	<i>Salix x rubens</i>
Weeping willow	<i>Salix x sepulcralis</i>
Spotted thistle	<i>Scolymus maculatus</i>
Holly leaved senecio	<i>Senecio glastifolius</i>
Athel pine, tamarisk	<i>Tamarix aphylla</i>
Laurel clock vine	<i>Thunbergia laurifolia</i>
Rosewood, tipuana tree	<i>Tipuana tipu</i>
Subterranean Cape sedge	<i>Trianoptiles solitaria</i>

Invasiveness Assessment Record

Scientific name: *Acacia catechu*

Common Name: cutch tree

QUESTION	COMMENTS	RATING	CONFIDENCE
Establishment			
1. Germination requirements?	Seeds germinate with rains at any time of year(CABI 2005). Opportunistic germinator.	H	MH
2. Establishment requirements?	Requires light to establish and grow, very sensitive to shade (CABI 2005).	ML	MH
3. How much disturbance is required?	Common on riverbanks and watersheds (CABI 2005). Likes openwoodlands and grasslands with a tendency to invade degraded areas such as overgrazed grassland. Can establish in relatively intact ecosystems (CRC for Australian Weed Management 2003)	MH	MH
Growth/Competitive			
4. Life form?	Leguminous, perennial non-climbing tree (CABI 2005).	MH	MH
5. Allelopathic properties?	None described in CABI (2005).	L	MH
6. Tolerates herb pressure?	A common fodder species browsed by wild and domesticated animals in its native range. Over thirty beetle species have been identified with eight linked to defoliation of trees (CABI 2005). Weed still persists.	ML	MH
7. Normal growth rate?	Relatively 'slow-growing' tree in natural environments (CRC for Australian Weed Management 2003).	L	M
8. Stress tolerance to frost, drought, w/logg, sal. etc?	Can tolerate frost (to -1°C), saline soil tolerant, tolerant of fire and drought. Seeds susceptible to waterlogging (CABI 2005).	MH	MH
Reproduction			
9. Reproductive system	Reproduces by seed only. No information on whether self and /or cross- pollination occurs so scores as ML (CABI 2005).	ML	MH
10. Number of propagules produced?	Seedpods contain between four and seven seeds. Mature trees produce 'large numbers' of seeds. Assume greater than 2000 propagules produced per flowering event (CRC for Australian Weed Management 2003).	H	M
11. Propagule longevity?	Exact length not known but 'probable that some seeds remain viable for about 20 years' (CRC for Australian Weed management 2003).	ML	M
12. Reproductive period?	Not specified although in areas where grown for forestry rotated every 20 years. Trees live up to 60 years. Score High as likely that produces viable propagules for greater than 10years and records of the tree forming monocultures in some areas in Asia (CABI 2005).	H	MH
13. Time to reproductive maturity?	Life cycle under Australian conditions is unknown and time to reproductive maturity is unclear (Parsons & Cuthbertson 2001). Therefore score as medium.	M	MH

Invasiveness Assessment Record

Scientific name: *Acacia catechu*

Common Name: cutch tree

QUESTION	COMMENTS	RATING	CONFIDENCE
Dispersal			
14. Number of mechanisms?	Transported by cattle, water, humans, machinery movement (CABI 2005).	MH	MH
15. How far do they disperse?	Can be transported long distances by cattle therefore likely that some propagules will spread greater than 1 km (CRC for Australian Weed management 2003).	H	M

References cited:

CAB International 2005, *Acacia catechu*, Forestry Compendium, CAB International, Wallingford, viewed: 04 Nov 2005,

http://www.cabicompendium.org/fc/datasheet.asp?CCODE=ACA_CA&COUNTRY=0

CRC for Australian Weed Management 2003, *Weed management guide, cutch tree (Acacia catechu)*, Department of Environment and Heritage, Canberra, viewed: 04 Nov 2005,

<http://www.deh.gov.au/biodiversity/invasive/publications/pubs/a-catechu.pdf>

Parsons, W.T. & Cuthbertson, E. G. 2001, *Noxious weeds of Australia*, 2nd edn, CSIRO Publishing, Collingwood.

Revisions

Date	Revised by	Revision

Present distribution of *Acacia catechu* in Victoria

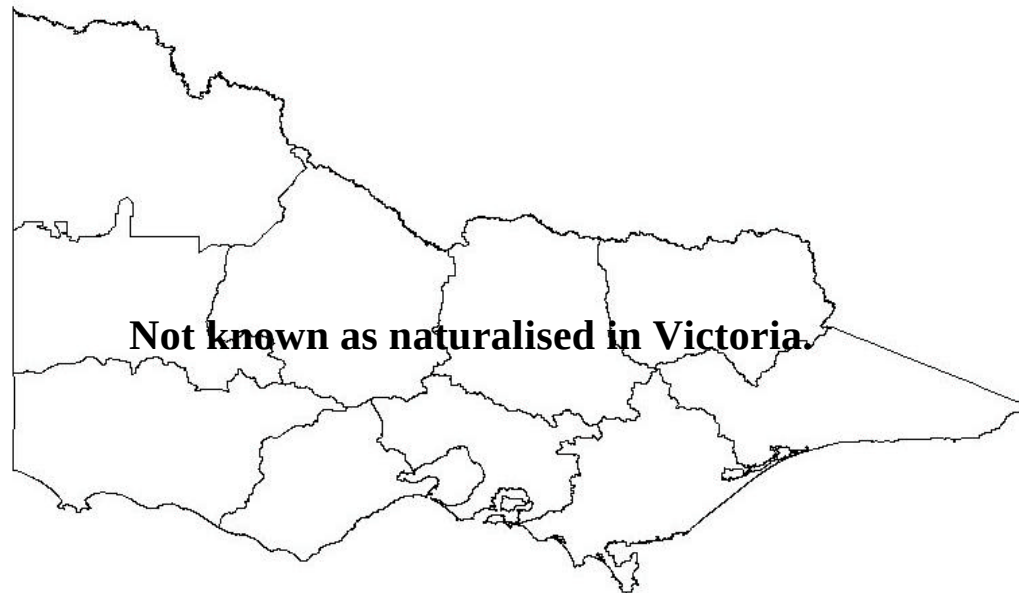
Scientific name: *Acacia catechu* (L. f.) Willd.

Common name(s): cutch tree

Status:

Habitat:

Subtropical or tropical open woodlands and shrubby grasslands. Usually occurs on shallow to medium depth sandy loams. Occurs as a weedy shrub on overgrazed grasslands in India and Burma (Parsons & Cuthbertson 2001). Occurs naturally in mixed deciduous forests and savannas of lower mountains and hills. Especially common in drier regions on sandy soils and riverbanks and watersheds. Altitude 0-1500m; Mean annual temperature 32-39 deg. C; Mean annual rainfall 500-2000mm (World Agroforestry Centre 2005)



Potential distribution of *Acacia catechu* in Victoria

Scientific name: *Acacia catechu* (L. f.) Willd.

Common name(s): cutch tree

Status:

Habitat: Subtropical or tropical open woodlands and shrubby grasslands. Usually occurs on shallow to medium depth sandy loams. Occurs as a weedy shrub on overgrazed grasslands in India and Burma (Parsons & Cuthbertson 2001). Occurs naturally in mixed deciduous forests and savannas of lower mountains and hills. Especially common in drier regions on sandy soils and riverbanks and watersheds. Altitude 0-1500m; Mean annual temperature 32-39 deg. C; Mean annual rainfall 500-2000mm (World Agroforestry Centre 2005)

Potential distribution produced from CLIMATE modelling refined by applying suitable landuse and vegetation type overlays with CMA boundaries

MAP OVERLAYS USED.

Land Use:

Pasture dryland
Forest private plantation
Forest public plantation

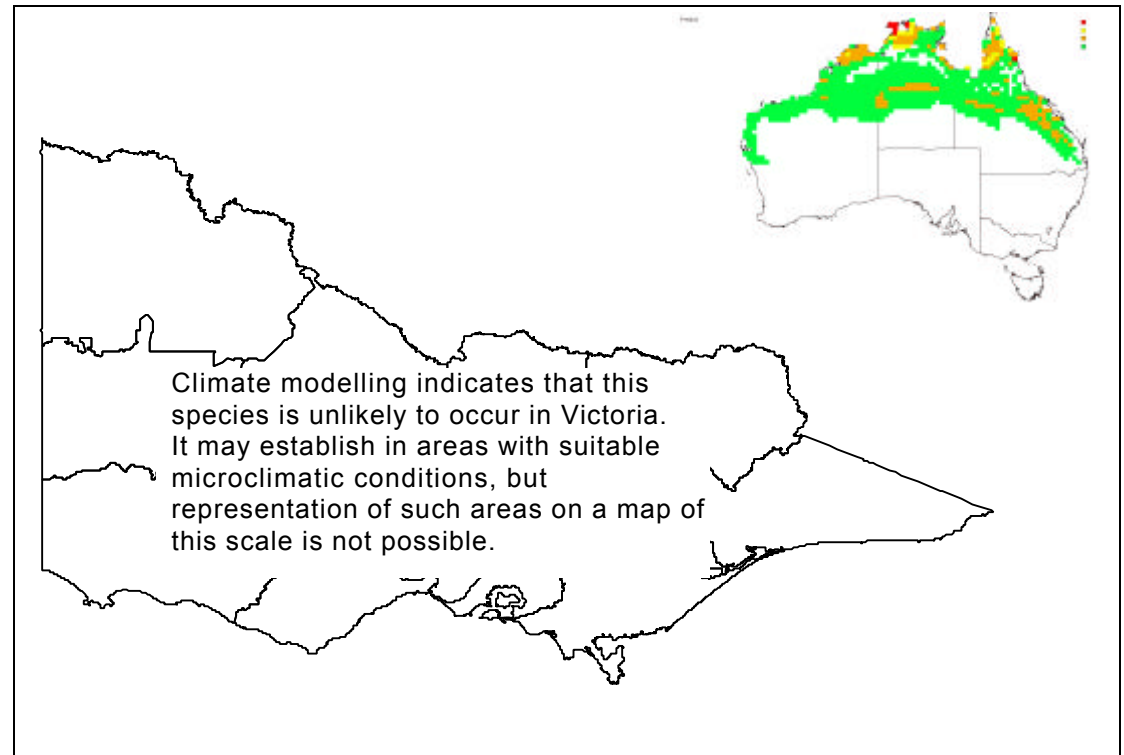
Broad vegetation types

Coastal scrubs and grassland; Coastal grassy woodland; Heathy woodland; Lowland forest; Dry foothill forest; Grassland; Plains grassy woodland; Valley grassy forest; Riverine grassy woodland; Riparian forest; Rainshadow woodland; Mallee woodland

Colours indicate possibility of infesting these areas.

Red	= Very high	Yellow	= High
Orange	= Medium	Green	= Likely

In the non-coloured areas the plant is unlikely to establish as the climate, soil or landuse is not presently suitable.



Impact Assessment Record

Scientific Name: Acacia catechu

Common name: black cutch, cutch tree

QUESTION	COMMENTS	RATING	CONFIDENCE
Social			
1. Restrict human access?	Trees range from 3 to 15 metres with average height when fully grown between 10 to 15 metres (CABI 2005). Trees have a light feathery crown. Forms 'dense impenetrable stands' and the sharp thorns .. can impede the movement and mustering of stock'. When fully grown, stems up to 30cm diameter (CRC for Australian Weed Management 2003). As common on riverbanks and watersheds, plant would be a major impediment to access waterways.	H	MH
2. Reduce tourism?	As the weed can be found on riverbanks and watersheds, it is possible that some recreational uses may be affected eg. swimming, fishing, boating (World Agroforestry Centre 2005).	MH	MH
3. Injurious to people?	The branchlets have 'twin hooked prickles'. These prickles are present throughout the year (CABI 2005).	H	MH
4. Damage to cultural sites?	Not likely that the plant would do any structural damage but due to size and potential to spread (CABI 2005), would have moderate visual effect.	ML	MH
Abiotic			
5. Impact flow?	Terrestrial species (CABI 2005).	L	MH
6. Impact water quality?	Terrestrial species (CABI 2005).	L	MH
7. Increase soil erosion?	'..apart from checking soil erosion. On steep slopes, its roots bind the soil and prevent landslides or excessive erosion'. Tree has a strong primary root (up to 2 metres deep) which is long and wiry with lateral short, fibrous roots (CABI 2005). Does not replace ground cover so unlikely to leave ground exposed. Low probability of large scale soil movement.	L	MH
8. Reduce biomass?	As the plant likes open woodlands and grasslands with a tendency to invade degraded areas (CRC for Australian Weed Management 2003), biomass may increase.	L	M
9. Change fire regime?	Deciduous tree. Although 'the wood is excellent firewood', and would burn well once ignited there is nothing to indicate that the tree would change the frequency or intensity of fires (CABI 2005). In Australia, the known distribution of <i>Acacia catechu</i> is sparse so wouldn't contribute to either intensity or frequency.	L	MH
Community Habitat			
10. Impact on composition (a) high value EVC	Potential distribution of <i>Acacia catechu</i> excludes Victoria. No impact on EVCs in Victoria.	L	H
(b) medium value EVC	Potential distribution of <i>Acacia catechu</i> excludes Victoria. No impact on EVCs in Victoria.	L	H
(c) low value EVC	Potential distribution of <i>Acacia catechu</i> excludes Victoria. No impact on EVCs in Victoria.	L	H
11. Impact on structure?	Found with other dry deciduous species, and grasses. Can occur in both open grasslands and also within dry forests (CABI 2005). 'Occurs as a weedy shrub on overgrazed grasslands' (Parsons & Cuthbertson 2001). Therefore, it	L	MH

Impact Assessment Record

Scientific Name: Acacia catechu

Common name: black cutch, cutch tree

QUESTION	COMMENTS	RATING	CONFIDENCE
	may exclude understorey species eg grasses. Will affect only one of the stratum.		
12. Effect on threatened flora?	The potential for <i>Acacia catechu</i> to establish and naturalise in Victoria is highly unlikely due to ecoclimatic limitations. No impact on threatened flora in Victoria.	L	H
Fauna			
13. Effect on threatened fauna?	The potential for <i>Acacia catechu</i> to establish and naturalise in Victoria is highly unlikely due to ecoclimatic limitations. No impact on threatened fauna in Victoria.	L	H
14. Effect on non-threatened fauna?	'The sharp thorns .. can impede the movement and mustering of stock' (CRC for Australian Weed Management 2003). In agricultural situations the plant may be a problem but in natural situations may not hinder or affect fauna eg access to water, but may have a minor effect.	ML	M
15. Benefits fauna?	In India it is known to be 'an excellent source of food for wildlife' (CABI 2005). May provide an alternate food source for native fauna.	ML	MH
16. Injurious to fauna?	'The bark is toxic and contains an alkaloid' (CABI 2005). However, it is a common fodder species within its native range for both wild and domesticated animals so toxicity likely to have little effect. Forms 'dense impenetrable stands and the sharp thorns .. can impede the movement and mustering of stock' (CRC for Australian Weed Management 2003).	ML	MH
Pest Animal			
17. Food source to pests?	'Is a useful fodder species.. browsed by cattle, rhinoceros, deer and elephants'. Rodents are also reported to damage the tree' (CABI 2005). May supply food for one or more minor pest spp.	ML	MH
18. Provides harbor?	No evidence in CABI (2005) that the weed provides harbour for pest spp.	L	MH
Agriculture			
19. Impact yield?	Dense patches 'impede stock movement and access to other pasture plants' (Parsons & Cuthbertson 2001). Could impact stock access to water with potential to have minor impact on quantity of produce.	ML	MH
20. Impact quality?	Not known to effect quality of produce.	L	MH
21. Affect land value?	No documented evidence that weed would affect land value.	L	MH
22. Change land use?	No evidence to suggest that the weed would cause a change in priority of land use.	L	MH
23. Increase harvest costs?	No evidence to suggest that the weed would increase the cost of harvest.	L	MH
Disease host/vector?	Not a known host or vector for diseases of agriculture.	L	MH

Impact Assessment Record

Scientific Name: Acacia catechu

Common name: black cutch, cutch tree

References cited:

CAB International 2005, *Acacia catechu*, Forestry Compendium, CAB International, Wallingford, viewed: 04 Nov 2005,
http://www.cabcompendium.org/fc/datasheet.asp?CCODE=ACA_CA&COUNTRY=0

CRC for Australian Weed Management 2003, *Weed management guide, cutch tree (Acacia catechu)*, Department of Environment and Heritage, Canberra, viewed: 04 Nov 2005,
<http://www.deh.gov.au/biodiversity/invasive/publications/pubs/a-catechu.pdf>

Parsons, W.T. & Cuthbertson, E. G. 2001, *Noxious weeds of Australia*, 2nd edn, CSIRO Publishing, Collingwood.

World Agroforestry Centre 2005, *Species identity: Acacia catechu*, Agroforestry Database, World Agroforestry Centre, viewed: 04 Nov 2005,
<http://www.worldagroforestry.org/Sites/TreeDBS/aft.asp>

Revisions

Date	Revised by	Revision

Invasiveness Assessment Record

Scientific name: *Acacia nilotica* ssp. *indica*

Common Name: prickly acacia

QUESTION	COMMENTS	RATING	CONFIDENCE
Establishment			
1. Germination requirements?	‘Seeds germinate after significant rainfall in late spring and summer’ (DNRME 2004) ‘...germination does not occur until triggered by water penetrating the hard seed coat. Germination occurs between 14° and 37°C. (Mackey 1998). Requires natural seasonal disturbance of rainfall and summer temperatures.	MH	MH
2. Establishment requirements?	‘..but seedlings are shade intolerant. Although seedling establishment can occur in drier times, survival is low. If rainfall following germination is below average, the majority of seedlings on black soil will die within two years’ (Mackey 1998). Seedlings require open conditions and regular rainfall. ...	ML	MH
3. How much disturbance is required?	Dense infestations occur where there is a plentiful supply of water, for example, along watercourses and bore water drains. With an abundant supply of water and little shading by other plants, growth is rapid, but, ‘...on open downs where it is drier, a good grass cover may reduce growth’ (Mackey 1998). More likely to establish in disturbed situation where there is little competition.	ML	MH
Growth/Competitive			
4. Life form?	Tree, commonly to 6 metres, but can grow to 15 metres in optimal situation (Mackey 1998). Other life form.	L	MH
5. Allelopathic properties?	None described. Growth of perennial grasses under the canopy is greatly inhibited particularly during dry periods, however, annual and ephemeral species appear to be unaffected. Effect due to competition perennials for moisture and nutrients (Mackey 1998).	L	MH
6. Tolerates herb pressure?	Seedlings are spiny, but sheep are known to browse on the lower branches of established plants. Domesticated animals consume the abundant seedpods in preference to the tree (Mackey 1998). Tolerates herbivory pressure.	MH	MH
7. Normal growth rate?	Given access to water, seedling growth is rapid (Mackey 1998).	H	MH
8. Stress tolerance to frost, drought, w/logg, sal. etc?	It is reported that frost kills young plants and prevents seed set in older, established trees (Mackey 1998). However, in some frost prone areas in Queensland infestations of prickly acacia are established and spreading. Prickly acacia tolerates salinity if fresh water is present. It has a deep taproot, which enables it to survive dry periods. In Africa it is known to tolerate seasonal waterlogging (Duke 1983). Tolerates two or more stressors.	H	MH
Reproduction			
9. Reproductive system	Reproduces sexually; self and cross pollination. Most flowers are functionally male while others are hermaphroditic (Mackey 1998). Prickly acacia does not reproduce vegetatively.	ML	MH
10. Number of propagules produced?	Annually each tree produces an average of about 30000 seeds (Mackey 1998).	H	MH
11. Propagule longevity?	In bore drains (i.e. where water is plentiful) seed half-life was found to be 10 months, but some seed is known to survive up to seven years (Mackey 1998).	L	MH

Invasiveness Assessment Record

Scientific name: *Acacia nilotica* ssp. *indica*

Common Name: prickly acacia

QUESTION	COMMENTS	RATING	CONFIDENCE
12. Reproductive period?	Prickly acacia is known to live for up to 60 years (DNRME 2004).	H	M
13. Time to reproductive maturity?	The plant reaches sexual maturity between 2 to 5 years (DNRME 2004).	ML	M
Dispersal			
14. Number of mechanisms?	Domestic animals, particular cattle are the most important vectors of seed. Ingested seed can remain in cattle for up to six days leading to viable seed being dispersed over large distances. Other vectors are floodwaters and wind (<25m) (Mackey 1998).	MH	MH
15. How far do they disperse?	Depending upon cattle movement, dispersal would be at least one kilometre, possibly greater (Mackey 1998).	H	MH

References cited:

Department of Natural Resources, Mines and Energy (DNRME), 2004, Approaches to management of prickly acacia (*Acacia nilotica* ssp. *indica*) in Australia, National case studies manual, State of Queensland

Duke, J.A., 1983, Handbook of energy crops, (unpublished). Online at http://www.hort.purdue.edu/newcrop/duke_energy/Acacia_nilotica.html , viewed 05/08/2005

Mackey, A.P., 1998, '*Acacia nilotica* ssp. *indica* (Benth.) Brenan,' in *Biology of Australian Weeds*, Vol 2, ed. F.D. Panetta, R.H. Groves and R.C.H. Shepherd, R.G. & F.J. Richardson, Meredith, Victoria

Revisions

Date	Revised by	Revision

Present distribution of *Acacia nilotica* ssp. *indica* in Victoria

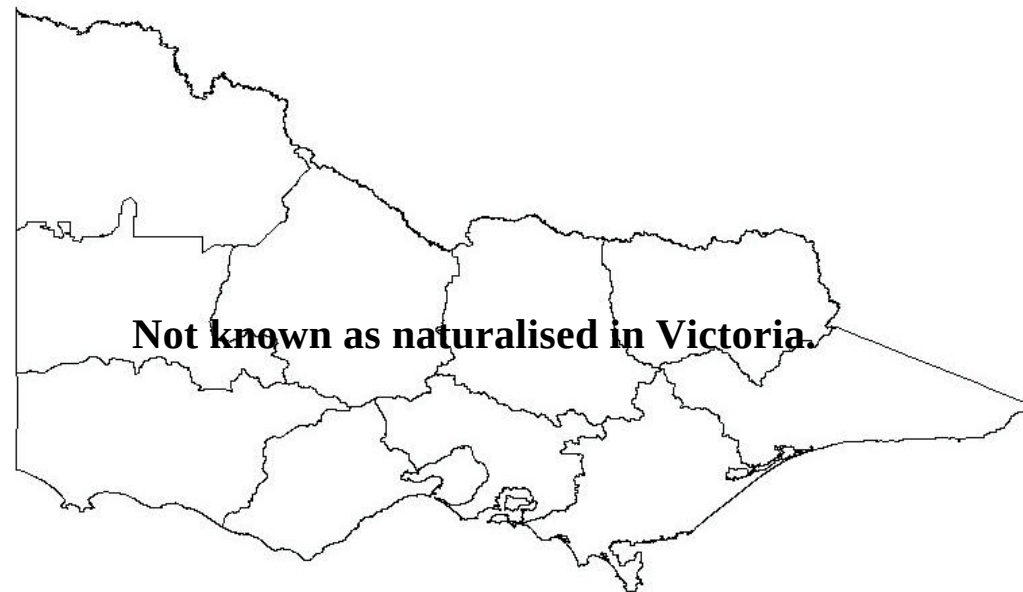
Scientific name: *Acacia nilotica* ssp. *indica* L.

Common name(s): Prickly acacia

Status:

Habitat:

Prefer tropical and subtropical climates. Found in woody grasslands and savannas. In northern Australia, found in Mitchell grasslands. Occurs on a wide range of soil types (DNRE 2004).



Potential distribution of *Acacia nilotica* ssp. *indica* in Victoria

Scientific name: *Acacia nilotica* ssp. *indica* L.

Common name(s): Prickly acacia

Status:

Habitat:

Prefer tropical and subtropical climates. Found in woody grasslands and savannas. In northern Australia, found in Mitchell grasslands. Occurs on a wide range of soil types (DNRE 2004).

Potential distribution produced from CLIMATE modelling refined by applying suitable landuse and vegetation type overlays with CMA boundaries

MAP OVERLAYS USED.

Land Use:

Dryland pasture, irrigated pasture

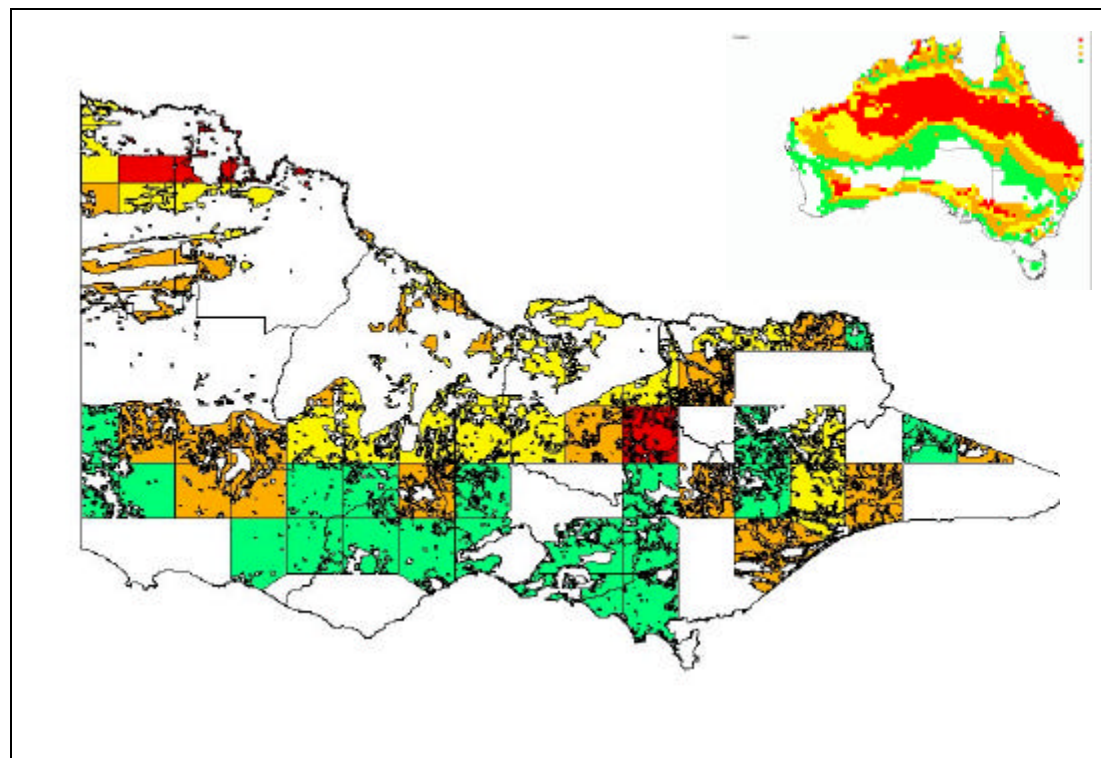
Broad vegetation types

Coastal scrubs and grassland, Coastal grassy woodland, Lowland forest, etc.

Colours indicate possibility of *Acacia nilotica* ssp. *indica* L. infesting these areas.

 Red	= Very high	 Yellow	= High
 Orange	= Medium	 Green	= Likely

In the non-coloured areas the plant is unlikely to establish as the climate, soil or landuse is not presently suitable.



Impact Assessment Record

Scientific Name: *Acacia nilotica* ssp. *indica*

Common name: prickly acacia

QUESTION	COMMENTS	RATING	CONFIDENCE
Social			
1. Restrict human access?	Shrub or small tree from 7 to 9 m high. 'Because of its rapid growth in favourable seasons and the presence of long spines or prickles, dense thickets of prickly acacia, impenetrable to stock, develop. Thickets along thousands of kilometres of bore drains prevent access to water' (Parsons & Cuthbertson 2001). Major impediment to access waterways.	H	MH
2. Reduce tourism?	Because of infestation by prickly acacia, "...the Mitchell grass downs are being converted into a thorny scrubland similar to the African thornveld" (Mackey 1998). Weeds presence is obvious to visitors.	H	MH
3. Injurious to people?	Young stems are armed with stout stipular spines 5 to 50 mm long, Spines may be absent on older stems. Dogs cannot be used for mustering purposes because of spines on the ground (Parsons & Cuthbertson 2001). Potential for injury throughout the year.	H	MH
4. Damage to cultural sites?	Shrub or small tree from 7 to 9 m high (Parsons & Cuthbertson 2001). Moderate visual effect.	ML	MH
Abiotic			
5. Impact flow?	Terrestrial species (Parsons & Cuthbertson 2001).	L	MH
6. Impact water quality?	Terrestrial species (Parsons & Cuthbertson 2001).	L	MH
7. Increase soil erosion?	"...a moderate canopy cover of prickly acacia reduces grass cover markedly and changes the relative abundance of native plant species in favour of forbs and annual grasses" (Mackey 1998). "Exacerbates and accelerates soil erosion" (ARMCANZ 2001).	MH	MH
8. Reduce biomass?	"In Australia, it occurs as a weed, principally along streams and bore drains, in the semi-arid tussock and hummock grasslands" (Parsons & Cuthbertson 2001). Biomass would increase in these situations.	L	MH
9. Change fire regime?	"...prickly acacia does not seem susceptible to fire" (Mackey 1998). Suppression of grass species also reduces fire risk. Minor change to frequency and intensity of fires.	ML	MH
Community Habitat			
10. Impact on composition (a) high value EVC	EVC= Plains Savannah (E); CMA=Mallee; Bioreg=Murray Mallee; Climate=VH. An infestation in Queensland has converted parts of the Mitchell grass downs into a thorny scrubland. "...a moderate canopy of prickly acacia reduces grass cover markedly" (Mackey 1998). Major displacement of some dominant species (grasses) within a strata (groundcover layer).	MH	MH
(b) medium value EVC	EVC= grassy dry forest (D); CMA=Goulburn Broken; Bioreg=Central Victorian Uplands; Climate=VH. An infestation in Queensland has converted parts of the Mitchell grass downs into a thorny scrubland. "...a moderate canopy of prickly acacia reduces grass cover markedly" (Mackey 1998). Major displacement of some dominant species (grasses) within a strata (groundcover layer).	MH	MH
(c) low value EVC	EVC= Lowland Forest (LC); CMA=Goulburn Broken; Bioreg=Highlands-Northern Fall; Climate=VH. An infestation in Queensland has converted parts of the Mitchell grass downs into a thorny scrubland. "...a moderate canopy of prickly acacia reduces grass cover markedly" (Mackey 1998). Major displacement of some dominant species (grasses) within a strata (groundcover layer).	MH	MH

Impact Assessment Record

Scientific Name: *Acacia nilotica* ssp. *indica*

Common name: prickly acacia

QUESTION	COMMENTS	RATING	CONFIDENCE
11. Impact on structure?	An infestation in Queensland has converted parts of the Mitchell grass downs into a thorny scrubland. "...a moderate canopy of prickly acacia reduces grass cover markedly" (Mackey 1998). Serious impact on grasses.	MH	MH
12. Effect on threatened flora?	The potential for <i>A. nilotica</i> ssp. <i>indica</i> to establish and naturalise in Victoria is highly unlikely due to ecoclimatic limitations (Thorp & Lynch 2000). No impact on threatened flora in Victoria.	L	MH
Fauna			
13. Effect on threatened fauna?	The potential for <i>A. nilotica</i> ssp. <i>indica</i> to establish and naturalise in Victoria is highly unlikely due to ecoclimatic limitations (Thorp & Lynch 2000). No impact on threatened fauna in Victoria.	L	MH
14. Effect on non-threatened fauna?	"Since even a moderate canopy cover of prickly acacia reduces grass cover markedly and changes the relative abundance of native plant species in favour of forbs and annual grasses, this, and the shift in structure toward a shrub community, is producing a dramatic effect on native fauna habitat and the overall ecology of the system" (Mackey 1998). Major impact on habitat.	MH	MH
15. Benefits fauna?	"Its leaf is very digestible and has a high protein content" (Mackey 1998). May provide alternative food source for larger native herbivores.	MH	MH
16. Injurious to fauna?	"Dogs cannot be used because of the many thorns on the ground" (Parsons & Cuthbertson 2001). Potential for injury to non-ungulate species.	MH	MH
Pest Animal			
17. Food source to pests?	"...the Australian plague locust (<i>Chortoicetes terminifera</i> (Walker)) is reported to feed on it," though without any known flow-on to impact on agricultural activities (Mackey 1998). Provides food for an environmental insect pest.	ML	MH
18. Provides harbor?	Not known to provide harbor for pest species.	L	MH
Agriculture			
19. Impact yield?	"Dense infestations significantly reduce pasture production...and the access of stock to water. Under normal grazing pressure a 25–30% canopy cover of prickly acacia reduces pasture production by 50% compared with acacia-free pasture" (Mackey 1998). Significant reduction in carrying capacity leading to reduced yield.	H	MH
20. Impact quality?	Not known to affect the quality of produce	L	MH
21. Affect land value?	"Heavily infested land is almost worthless since reclamation costs are often close to, or exceed, the value of uninfested land" (Mackey 1998). Serious impact on land value.	H	MH
22. Change land use?	See comment in 21 above. Land may be abandoned for agricultural use.	H	MH
23. Increase harvest costs?	"Dense infestations of prickly acacia...increase mustering time and cost." An increase in cost of more than 10 times the usual cost is reported (Mackey 1998). Increase in both time and labour to harvest produce.	H	MH
24. Disease host/vector?	"Prickly acacia is a host for a variety of organisms which attack it, but it does not appear to be a primary host for any other pests in Australia, though the Australian plague locust (<i>Chortoicetes terminifera</i> (Walker)) is reported to feed on it" (Mackey 1998).	L	MH

Impact Assessment Record

Scientific Name: Acacia nilotica ssp. indica

Common name: prickly acacia

References cited:

Agriculture and Resource Management Council of Australia & New Zealand, Australian & New Zealand Environment & Conservation Council and Forestry Ministers 2001, *Weeds of National Significance Prickly Acacia (Acacia nilotica subsp. indica) Strategic Plan*. National Weeds Strategy Executive Committee, Launceston

Mackey, A.P. 1998, 'Acacia nilotica ssp. indica (Benth.) Brenan,' in *Biology of Australian Weeds*, Vol 2, ed. F.D. Panetta, R.H. Groves and R.C.H. Shepherd, R.G. & F.J. Richardson, Meredith, Victoria

Thorp, JR & Lynch, R. 2000, *The Determination of Weeds of National Significance*. National Weeds Strategy Executive Committee, Launceston

Revisions

Date	Revised by	Revision
11 Aug. 05	TDH	Comments and rating for threatened flora and fauna added.

Invasiveness Assessment Record

Scientific name: *Ambrosia artemisiifolia*.L.

Common Name: annual ragweed

QUESTION	COMMENTS	RATING	CONFIDENCE
Establishment			
1. Germination requirements?	Germination is combination of light and temperature and although usually germinates in spring, can germinate at other times of year if conditions are suitable (Parsons & Cuthbertson 2001, DNRM 2005).	MH	MH
2. Establishment requirements?	Prefers dry, sunny grassy plains, along riverbanks, roadsides, disturbed soils, vacant lots and ruderal sites (Parsons & Cuthbertson 2001). Limited growth in shade.	ML	MH
3. How much disturbance is required?	“Primarily a plant of disturbed open areas... occurs as weed of cultivated lands, stubble fields, old pastures, wastelands’ (Parsons & Cuthbertson 2001)	ML	MH
Growth/Competitive			
4. Life form?	Annual herb (Parsons & Cuthbertson 2001) – life form –other.	L	MH
5. Allelopathic properties?	Annual ragweed ‘produces allelopathic responses in several other weed and crop species .. strongly inhibit germination of onion, oats, <i>Lolium</i> spp. (Parsons & Cuthbertson 2001)	MH	MH
6. Tolerates herb pressure?	Cattle eat annual ragweed in early stages. A variegated leaf beetle and stem-galling moth are used in biological control in Queensland with the moth ‘reducing ragweed populations and seed production in warmer areas’ (Parsons & Cuthbertson 2001).	ML	MH
7. Normal growth rate?	Serious competitor with cereal crops and vegetables in early growth stage but poor competitor in well managed pastures and legume crops. Growth rate rapid depending on environment (Parsons & Cuthbertson 2001). Most often occurs in wasteland areas so score as Medium High.	MH	MH
8. Stress tolerance to frost, drought, w/logg, sal. etc?	Due to the locations it can be found, it appears to have saline tolerance. Susceptible to frost and fire. Drought tolerant. Can be found in flood plains but no mention of ability to withstand waterlogging (Parsons & Cuthbertson 2001).	ML	MH
Reproduction			
9. Reproductive system	Wind pollinated. A ‘self-compatible species’ (Bassett & Crompton 1975 (cited in Genton, Shykoff & Giraud). Cross and self-pollination but cannot vegetatively reproduce (Parsons & Cuthbertson 2001).	ML	H
10. Number of propagules produced?	Annual ragweed produces an average of 3000 seeds per year (Parsons & Cuthbertson 2001).	H	MH
11. Propagule longevity?	Annual ragweed seeds can be viable for more than 40 years (Parsons & Cuthbertson 2001).	H	MH
12. Reproductive period?	Annual plant (Parsons & Cuthbertson 2001).	L	MH
13. Time to reproductive maturity?	Reaches maturity in 4-5 months (Parsons & Cuthbertson 2001).	H	MH
Dispersal			
14. Number of mechanisms?	Clings to sheep, furred animals, bags, clothing, water, contaminated gravel and soil (Parsons & Cuthbertson 2001).	MH	MH

Invasiveness Assessment Record

Scientific name: *Ambrosia artemisiifolia*.L.

Common Name: annual ragweed

QUESTION	COMMENTS	RATING	CONFIDENCE
15. How far do they disperse?	Spreads 'readily over long distances'. Hull provides buoyancy (Parsons & Cuthbertson 2001). Seems likely that some of the propagules will disperse greater than 1km.	H	MH

References cited:

Department of Natural Resources and Mines 2005, Annual ragweed: *Ambrosia artemisiifolia*, Department of Natural Resources and Mines, Brisbane, viewed 08 Nov 2005, <http://www.nrm.qld.gov.au/factsheets/pdf/pest/pp7.pdf>

Genton, B. J., Shykoff, J. A. & Giraud, T. 2005, 'High genetic diversity in French invasive populations of common ragweed, *Ambrosia artemisiifolia*, as a result of multiple sources of introduction', *Molecular Ecology*, vol. 14, no. 14, pp. 4275 – 4285, viewed: 18 Nov 2005, from Blackwell Synergy database.

Parsons, W.T. & Cuthbertson, E. G. 2001, *Noxious weeds of Australia*, 2nd ed., CSIRO Publishing, Collingwood.

Schmoll, J.T., Regnier, E.E. & Harrison, S. K. 2004, *Giant ragweed interference among cropping systems*, [abstract]. North Central Weed Science Society Proceedings. vol. 59, p. 162, viewed 08 Nov 2005, <http://www.ncwss.org/proceed/2004/proc04/abstracts/098.pdf>

Revisions

Date	Revised by	Revision

Present distribution of *Ambrosia artemisiifolia* in Victoria

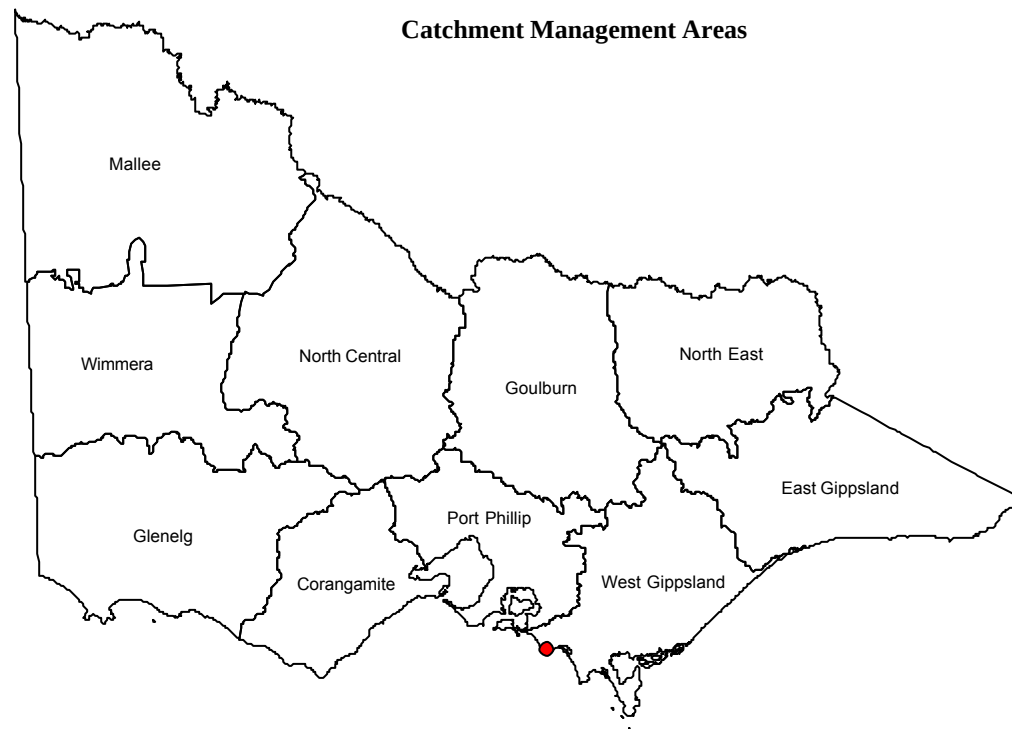
Scientific name: *Ambrosia artemisiifolia* L.

Common name(s): annual ragweed

Status:

Habitat:

Native of North America, most prevalent in eastern and north central States. First recorded as naturalised at Murwillumbah, NSW. Now common along north coast of NSW. Primarily plant of disturbed open areas, occurs as weed of cultivated lands, stubble fields, old pastures, wastelands, roadsides, railway reserves and vacant lots (Parsons & Cuthbertson 2001).



Potential distribution of *Ambrosia artemisiifolia* in Victoria

Scientific name: *Ambrosia artemisiifolia* L.

Common name(s): annual ragweed

Status:

Habitat:

Native of North America, most prevalent in eastern and north central States. First recorded as naturalised at Murwillumbah, NSW. Now common along north coast of NSW. Primarily plant of disturbed open areas, occurs as weed of cultivated lands, stubble fields, old pastures, wastelands, roadsides, railway reserves and vacant lots (Parsons & Cuthbertson 2001).

Potential distribution produced from CLIMATE modelling refined by applying suitable landuse and vegetation type overlays with CMA boundaries

MAP OVERLAYS USED.

Land Use:

Broadacre cropping
Horticulture
Pasture dryland
Pasture irrigation

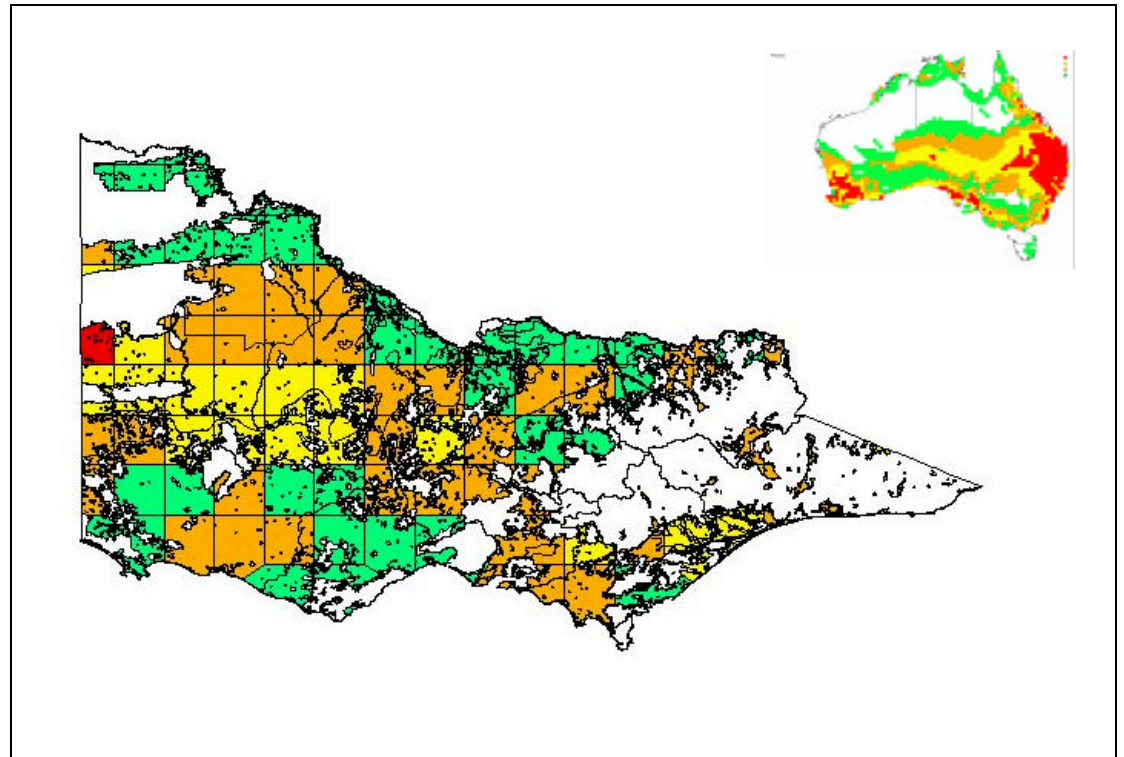
Broad vegetation types

Coastal scrubs and grassland; coastal grassy woodland; grassland;
plains grassy woodland

Colours indicate possibility of *Ambrosia artemisiifolia* infesting these areas.

Red	= Very high	Yellow	= High
Orange	= Medium	Green	= Likely

In the non-coloured areas the plant is unlikely to establish as the climate, soil or landuse is not presently suitable.



Impact Assessment Record

Scientific Name: *Ambrosia artemisiifolia*

Common name: annual ragweed

QUESTION	COMMENTS	RATING	CONFIDENCE
Social			
Restrict human access?	Grows to 350cm but usual height is between 50 and 200cm. A much branched, hairy herb (Parsons & Cuthbertson 2001). The height may impede individual access – low nuisance value.	ML	MH
Reduce tourism?	Most species are ‘so ordinary in appearance that they are rarely noticed despite their abundance’. However, as they are serious contributors to hay fever in US, some places advertise as ‘ragweed free’ (Parsons & Cuthbertson 2001). At certain times of the year, ragweed has the potential to have a major impact on recreation.	H	MH
Injurious to people?	‘Most important hay-fever producing plant in North America’. Also associated with asthma and can cause contact dermatitis (Parsons & Cuthbertson 2001). Serious problem in autumn and as an annual herb dies off after flowering.	ML	MH
Damage to cultural sites?	Not known to cause structural damage. Little or negligible effect on aesthetics.	L	MH
Abiotic			
Impact flow?	Terrestrial species (Parsons & Cuthbertson 2001).	L	MH
Impact water quality?	Terrestrial species (Parsons & Cuthbertson 2001).	L	MH
Increase soil erosion?	Plants have a robust taproot system with ‘numerous branching fibrous roots’ (Parsons & Cuthbertson 2001). Unlikely that the species would contribute to large-scale soil erosion.	L	MH
Reduce biomass?	Likely that biomass would slightly increase as ‘exhibits a high degree of morphological and reproductive plasticity in response to encroachment by neighbouring plants’ (Sprague 2002).	L	H
Change fire regime?	Herbaceous plant. Unlikely that it would change the frequency or intensity of fires.	L	MH
Community Habitat			
Impact on composition (a) high value EVC	EVC= Low rises woodland (BCS =E); CMA=Wimmera; Bioreg=Lowan mallee; CLIMATE potential=VH. Weed doesn’t occur in healthy, well-established ecosystems. Occurs mostly in open, disturbed areas where less than 3 strata are present (Parsons & Cuthbertson 2001). Minor displacement of some dominant species within the lower stratum.	ML	MH
(b) medium value EVC	EVC= Shallow sands woodland (BCS =D); CMA=Wimmera; Bioreg=Lowan mallee; CLIMATE potential=VH. Weed doesn’t occur in healthy, well-established ecosystems. Occurs mostly in open, disturbed areas where less than 3 strata are present (Parsons & Cuthbertson 2001). Minor displacement of some dominant species within the lower stratum.	ML	MH
(c) low value EVC	EVC= Shrubby woodland (BCS =E); CMA=Wimmera; Bioreg=Lowan mallee; CLIMATE potential=VH. Weed doesn’t occur in healthy, well-established ecosystems. Occurs mostly in open, disturbed areas where less than 3 strata are present (Parsons & Cuthbertson 2001). Minor displacement of some dominant species within the lower stratum.	ML	MH

Impact Assessment Record

Scientific Name: *Ambrosia artemisiifolia*

Common name: annual ragweed

QUESTION	COMMENTS	RATING	CONFIDENCE
Impact on structure?	Weed doesn't occur in healthy, well-established ecosystems. Occurs mostly in open, disturbed areas where less than 3 strata are present (Parsons & Cuthbertson 2001). Likely to have a minor effect on plants in the lower stratum.	ML	MH
Effect on threatened flora?	No information available.	MH	L
Fauna			
Effect on threatened fauna?	No information available.	MH	L
Effect on non-threatened fauna?	Annual ragweed is 'unpalatable to horses' (digester class) but cattle (fermenter class) can eat it so likely that native fauna (usually fermenters) can also (Parsons & Cuthbertson 2001). Tends to grow in ruderal sites so assume that there is no reduction in food for non threatened fauna.	L	MH
Benefits fauna?	In the US the seed 'provides food for pheasants, quail, dove, grouse, prairie chicken and songbirds..attract insects..provide browse for deer and rabbits' (Scott 2001). Possible that provides some assistance to desirable species in Victoria eg. quails, doves, ground-dwelling birds.	MH	H
Injurious to fauna?	Beaked and spined seed attach to sheep and furred animals but no documented evidence that it impacts upon health of animal (Parsons & Cuthbertson 2001).	L	MH
Pest Animal			
Food source to pests?	In the US provides browse for rabbits (Parsons & Cuthbertson 2001). Therefore possible that rabbits also browse weed in Victoria.	MH	MH
Provides harbor?	Not likely that it provides harbour for pest spp.	L	MH
Agriculture			
Impact yield?	In US, shown to impact upon sweet corn yield. Also serious competitor in 'cereals, maize, vegetables, sunflowers, soybeans and tobacco'. Competes for nutrients in orchards. 'Grows densely to detriment of crops and pasture'. 'Annual ragweed densities in excess of 0.5 plants per metre reduce soybean yields significantly' (Williams & Masiunas 2004).	H	H
Impact quality?	Shown to effect several quality traits in corn (green ear mass, husked ear mass, ear length and width, kernel mass, depth and kernels per row) (Williams & Masiunas 2004)..	MH	H
Affect land value?	No information on whether or not the weed affects land value. Numerous studies on effect of annual ragweed on cropping systems but no references made to land values.	L	MH
Change land use?	Even though the weed does affect crop yield and quality there is no reference made to a change in priority of land use. Assume that there would be little or no change.	L	MH
Increase harvest costs?	Spined seeds difficult to remove from wool so added costs in acid carbonate used for removal (Williams & Masiunas 2004)..	MH	H
Disease host/vector?	Acts as an 'alternate host in the development of sclerotinia rot of cabbages' (Scott 2001).	MH	MH

Impact Assessment Record

Scientific Name: *Ambrosia artemisiifolia*

Common name: annual ragweed

References cited:

Parsons, W T & Cuthbertson, E G 2001, *Noxious weeds of Australia*, 2nd ed., CSIRO Publishing, Collingwood.

Scott, R. 2001, 'Ragweed: *Ambrosia artemisiifolia*', *Progressive Farmer*, vol. 116, no. 4, p. 80, Birmingham, viewed: 07 Nov 2005, Proquest Database.

Sprague, C. 2002, '*Taming the two giants*', Crop Sciences, University of Illinois, viewed 8 Nov 2005, <http://www.cropsci.uiuc.edu/classic/2002/Article2/>

Williams, M.M., Masiunas, J.B. 2004, *Effect of giant ragweed interference on sweet corn yield and quality* [abstract]. North Central Weed Science Society Proceedings. vol. 59, p. 162, viewed 07 Nov 2005, http://www.ars.usda.gov/research/publications/publications.htm?SEQ_NO_115=177642

Revisions

Date	Revised by	Revision

Invasiveness Assessment Record

Scientific name: *Ambrosia confertiflora*

Common Name: burr ragweed

QUESTION	COMMENTS	RATING	CONFIDENCE
Establishment			
1. Germination requirements?	Germinates in autumn (Parsons & Cuthbertson 2001). Requires natural seasonal conditions.	MH	MH
2. Establishment requirements?	Prefers dryplains of temperate regions and is a weed of wastelands (Parsons & Cuthbertson 2001). Limited growth in shade.	ML	MH
3. How much disturbance is required?	Occurs in 'run-down pastures, orchards, roadsides, wastelands and other disturbed areas' (Parsons & Cuthbertson 2001). Established in highly disturbed natural ecosystems.	ML	MH
Growth/Competitive			
4. Life form?	Perennial herbaceous plants (Parsons & Cuthbertson 2001). Life form – other.	L	MH
5. Allelopathic properties?	<i>A. confertiflora</i> not documented to have allelopathic properties (Parsons & Cuthbertson).	L	MH
6. Tolerates herb pressure?	<i>A. confertiflora</i> not known to be eaten by animals and insects.	H	MH
7. Normal growth rate?	Seedlings grow at moderate rate during winter with growth rate increasing in spring (Parsons & Cuthbertson 2001). No indication that plant growth rate would equal competitive species of same life form. Therefore score as medium.	M	MH
8. Stress tolerance to frost, drought, w/logg, sal. etc?	'When dry periods occur in summer, aerial growth dies back and redevelops from the perennial roots in autumn' Drought tolerant. Can be found in flood plains but no mention of ability to withstand waterlogging (Parsons & Cuthbertson 2001). Due to locations found, assume weed has some tolerance to salinity.	ML	MH
Reproduction			
9. Reproductive system	Reproduces sexually and vegetatively (Parsons & Cuthbertson 2001).	H	MH
10. Number of propagules produced?	"All types (of ragweed) are prolific seeders ... average about 3000 seeds per year' (Parsons & Cuthbertson 2001).	H	MH
11. Propagule longevity?	Annual ragweed propagule longevity is up to 40 years (Schmoll, Reigner & Harrison 2004). In contrast, giant ragweed is only viable for 6 weeks (Parsons & Cuthbertson 2001). No information on <i>A. confertiflora</i> . Due to variation within genus, scored as medium.	M	H
12. Reproductive period?	Not specified. Form large colonies and plants known to live up to 10 years (Parsons & Cuthbertson 2001). Therefore score as medium high.	MH	MH
13. Time to reproductive maturity?	<i>A. confertiflora</i> reaches maturity in approximately 9 months (Parsons & Cuthbertson 2001).	H	MH

Invasiveness Assessment Record

Scientific name: *Ambrosia confertiflora*

Common Name: burr ragweed

QUESTION	COMMENTS	RATING	CONFIDENCE
Dispersal			
14. Number of mechanisms?	Known to be dispersed by clinging to sheep, furred animals, bags, clothing, water, contaminated gravel and soil (Parsons & Cuthbertson 2001).	MH	MH
15. How far do they disperse?	Spreads 'readily over long distances'. Hull provides buoyancy (Parsons & Cuthbertson 2001). Assume likely that some of the propagules will disperse greater than 1km.	H	MH

References cited:

Department of Natural Resources and Mines 2005, *Annual ragweed: Ambrosia artemisiifolia*, Department of Natural Resources and Mines, Brisbane, viewed 08 Nov 2005, <http://www.nrm.qld.gov.au/factsheets/pdf/pest/pp7.pdf>

Parsons, W T & Cuthbertson, E G 2001, *Noxious weeds of Australia*, 2nd ed., CSIRO Publishing, Collingwood.

Schmoll, J.T., Regnier, E.E. & Harrison, S. K. 2004, *Giant ragweed interference among cropping systems*, [abstract]. North Central Weed Science Society Proceedings. vol. 59, p. 162, viewed 08 Nov 2005, <http://www.ncwss.org/proceed/2004/proc04/abstracts/098.pdf>

Revisions

Date Revised by Revision

Present distribution of *Ambrosia confertiflora* in Victoria

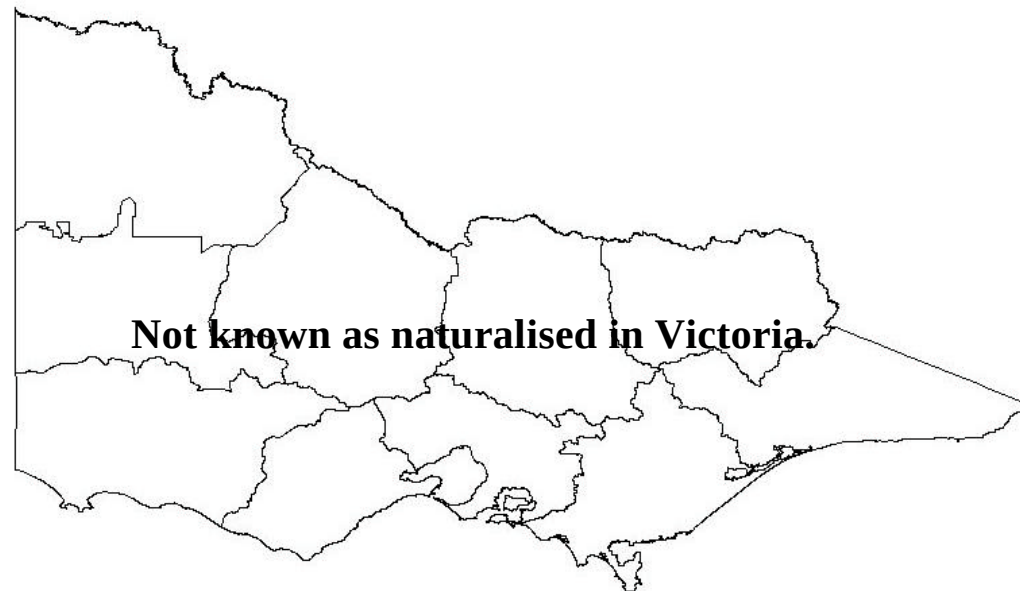
Scientific name: *Ambrosia confertiflora* DC.

Common name(s): burr ragweed

Status:

Habitat:

Dry plains of temperate regions, variety of soils. Occurring as a weed in run-down pastures, orchards, roadsides, wastelands and other disturbed areas. Native of southern United States and Mexico. Confined to small colonies in south-east Queensland and Central Western Slopes and North Western Plains of New South Wales (Parsons & Cuthbertson 2001).



Potential distribution of *Ambrosia confertiflora* in Victoria

Scientific name: *Ambrosia confertiflora* DC.

Common name(s): burr ragweed

Status:

Habitat:

Dry plains of temperate regions, variety of soils. Occurring as a weed in run-down pastures, orchards, roadsides, wastelands and other disturbed areas. Native of southern United States and Mexico. Confined to small colonies in south-east Queensland and Central Western Slopes and North Western Plains of New South Wales (Parsons & Cuthbertson 2001).

Potential distribution produced from CLIMATE modelling refined by applying suitable landuse and vegetation type overlays with CMA boundaries

MAP OVERLAYS USED.

Land Use:

Broadacre cropping

Pasture dryland / pasture irrigation

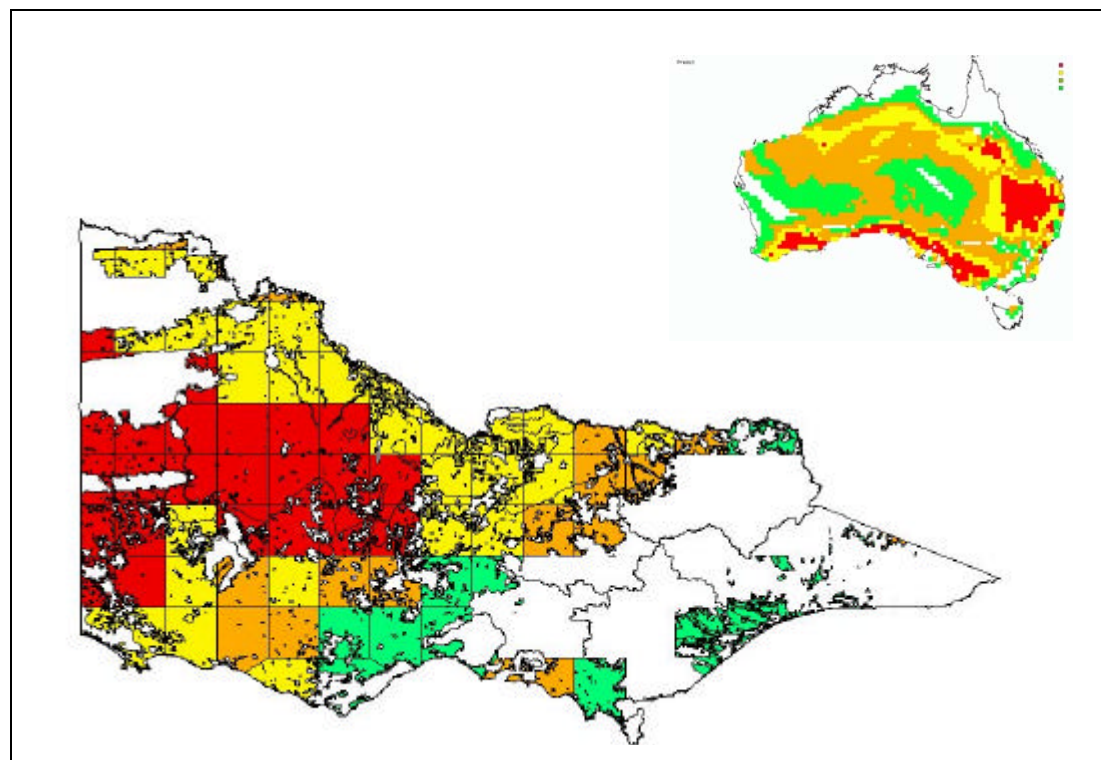
Broad vegetation types

Coastal scrubs and grassland; coastal grassy woodland; grassland;
plains grassy woodland; herb-rich woodland

Colours indicate possibility of *Ambrosia confertiflora* infesting these areas.

 Red	= Very high	 Yellow	= High
 Orange	= Medium	 Green	= Likely

In the non-coloured areas the plant is unlikely to establish as the climate, soil or landuse is not presently suitable.



Impact Assessment Record

Scientific name: *Ambrosia confertiflora*

Common Name: burr ragweed

QUESTION	COMMENTS	RATING	CONFIDENCE
Social			
1. Restrict human access?	Grows from 75 to 200cm. The burrs associated with burr ragweed and dermatogenic properties have the potential to impede individual access (Parsons & Cuthbertson 2001).	ML	MH
2. Reduce tourism?	Most species are 'so ordinary in appearance that they are rarely noticed despite their abundance'. All species are noted for their allergens and are a major contributor to hay fever in US, with some places advertising as 'ragweed free' (Parsons & Cuthbertson 2001). Potential to have major impact on tourism in autumn months when pollen counts is high.	H	MH
3. Injurious to people?	'Most important hay-fever producing plant in North America'. Also associated with asthma and dermatogenic properties. Burr ragweed 'burrs' cause discomfort throughout the year with three species having a high pollen count from late summer through to autumn being a major component in hayfever and asthma (Parsons & Cuthbertson 2001).	MH	MH
4. Damage to cultural sites?	Not known to cause structural damage. Little or negligible effect on aesthetics.	L	MH
Abiotic			
5. Impact flow?	Terrestrial species (Parsons & Cuthbertson 2001).	L	MH
6. Impact water quality?	Terrestrial species (Parsons & Cuthbertson 2001).	L	MH
7. Increase soil erosion?	In dry periods over summer and in autumn, aerial growth dies back. Plants have 'creeping runner-like roots' and form large colonies (Parsons & Cuthbertson 2001). Unlikely that the species would contribute to large-scale soil erosion.	L	MH
8. Reduce biomass?	Plant grows up to 200cm and forms large colonies. Often occurs in wasteland where little vegetation exists (Parsons & Cuthbertson 2001). Likely that biomass would slightly increase.	L	MH
9. Change fire regime?	Herbaceous plant (Parsons & Cuthbertson 2001) so assume that it would have small or negligible effect on fire risk.	L	MH
Community Habitat			
10. Impact on composition (a) high value EVC	EVC=Plains Grassy Woodland (E), CMA=Wimmera, Bioreg.=Wimmera, CLIMATE=VH. Weed doesn't occur in healthy, well-established ecosystems. Occurs mostly in open, disturbed areas where less than 3 strata are present (Parsons & Cuthbertson 2001). Very little displacement of any indigenous species.	L	MH
(b) medium value EVC	EVC=Hills Herb-rich Woodland (D), CMA=NorthCentral, Bioreg=Goldfields, CLIMATE=VH. Weed doesn't occur in healthy, well-established ecosystems. Occurs mostly in open, disturbed areas where less than 3 strata are present (Parsons & Cuthbertson 2001). Very little displacement of any indigenous species.	L	MH
(c) low value EVC	EVC=Coastal Tussock Grassland (LC), CMA=West Gippsland, Bioreg.=Gippsland Plain, CLIMATE=L. Weed doesn't occur in healthy, well-established ecosystems. Occurs mostly in open, disturbed areas where less than 3 strata are present (Parsons & Cuthbertson 2001). Very little displacement of any indigenous species.	L	MH

Impact Assessment Record

Scientific name: *Ambrosia confertiflora*

Common Name: burr ragweed

QUESTION	COMMENTS	RATING	CONFIDENCE
11. Impact on structure?	Weed doesn't occur in healthy, well-established ecosystems. Occurs mostly in open, disturbed areas where less than 3 strata are present (Parsons & Cuthbertson 2001). Usually only affecting one of the strata.	L	MH
12. Effect on threatened flora?	No information available.	MH	L
Fauna			
13. Effect on threatened fauna?	No information available.	MH	L
14. Effect on non-threatened fauna?	Tends to grow in ruderal sites so assume that there is no reduction in habitat/food/shelter for non threatened fauna spp. (Parsons & Cuthbertson 2001).	L	MH
15. Benefits fauna?	No documented evidence that <i>A. confertiflora</i> benefits fauna.	H	MH
16. Injurious to fauna?	Hooked spines and burrs attach to sheep and furred animals but no documented impact on health or well being of animals (Parsons & Cuthbertson 2001).	L	MH
Pest Animal			
17. Food source to pests?	No documented evidence that <i>A. confertiflora</i> is a food source to pests (Parsons & Cuthbertson 2001).	L	MH
18. Provides harbour?	No documented evidence that <i>A. confertiflora</i> provides harbour for pest spp.	L	MH
Agriculture			
19. Impact yield?	'Is an extremely competitive plant, readily suppressing pasture species...also a problem in orchards, competing for nutrients' (Parsons & Cuthbertson 2001). Minor impact on quantity of produce.	ML	MH
20. Impact quality?	Burr ragweed contaminates wool with hooked spines (Parsons & Cuthbertson 2001). Likely that would have greater than 5% impact on quality of produce.	MH	MH
21. Affect land value?	No information on whether or not the weed affects land value. Numerous studies on effect of annual ragweed and giant ragweed on cropping systems but no references made to burr ragweed and land values. Score medium.	M	L
22. Change land use?	Weed can be controlled by herbicides in pasture (Parsons & Cuthbertson 2001). Assume little or no change in priority of land use.	L	MH
23. Increase harvest costs?	'...a problem in orchards, competing for nutrients, interfering with the harvest, and both pollen and burrs cause discomfort to pickers' (Parsons & Cuthbertson 2001). Hooked spines difficult to remove from wool so added costs in acid carbonate used for removal (Parsons & Cuthbertson 2001). Increase in time, labour and cost.	M	MH
24. Disease host/vector?	None evident	L	MH

Impact Assessment Record

Scientific name: *Ambrosia confertiflora*

Common Name: burr ragweed

References cited:

Parsons, W T & Cuthbertson, E G 2001, *Noxious weeds of Australia*, 2nd ed., CSIRO Publishing, Collingwood.

Scott, R. 2001, 'Ragweed: *Ambrosia artemisiifolia*', *Progressive Farmer*, vol. 116, no. 4, p. 80, Birmingham, viewed: 07 Nov 2005, Proquest Database.

Revisions

Date	Revised by	Revision

Invasiveness Assessment Record

Scientific name: *Ambrosia tenuifolia*

Common Name: lacy ragweed

QUESTION	COMMENTS	RATING	CONFIDENCE
Establishment			
1. Germination requirements?	Seeds germinate in autumn (Parsons & Cuthbertson 2001). Requires seasonal temperatures.	MH	MH
2. Establishment requirements?	Found principally in open areas (Parsons & Cuthbertson 2001). Limited establishment in shade.	ML	MH
3. How much disturbance is required?	Primarily a plant of disturbed open areas... 'occurs as weed of roadsides, railway reserves, sand dunes, cultivated fields, stubble paddocks, degraded pastures, and waste places' (Parsons & Cuthbertson 2001). Establishes in highly disturbed natural ecosystems.	ML	MH
Growth/Competitive			
4. Life form?	Perennial herbaceous plants (Parsons & Cuthbertson 2001). Life form – other.	L	MH
5. Allelopathic properties?	<i>A. tenuifolia</i> not documented to have Allelopathic properties (Parsons & Cuthbertson 2001).	L	MH
6. Tolerates herb pressure?	Not documented to be eaten by animals or insects (Parsons & Cuthbertson 2001).	H	MH
7. Normal growth rate?	Growth rate of <i>A. tenuifolia</i> is not documented. Others species have different growth rates. Therefore score as medium.	M	L
8. Stress tolerance to frost, drought, w/logg, sal. etc?	Susceptible to fire and waterlogging. Drought tolerant. Due to the locations it can be found, it appears to have saline tolerance. No documented evidence of ability to withstand frost (Parsons & Cuthbertson 2001).	MH	MH
Reproduction			
9. Reproductive system	Reproduces sexually and vegetatively (Parsons & Cuthbertson 2001).	H	MH
10. Number of propagules produced?	"All types (of ragweed) are prolific seeders ... average about 3000 seeds per year' (Parsons & Cuthbertson 2001).	H	MH
11. Propagule longevity?	Annual ragweed propagule longevity is up to 40 years (Schmoll, Reigner & Harrison 2004). In contrast, giant ragweed is only viable for 6 weeks (Parsons & Cuthbertson 2001). No specific information on <i>A. tenuifolia</i> . Due to variation within genus, scored as medium.	M	H
12. Reproductive period?	Other ragweed species known to live up to 10 years. Lacy ragweed can form dense colonies (Parsons & Cuthbertson 2001).	H	MH
13. Time to reproductive maturity?	These three ragweed species reach maturity in approximately 9 months (Parsons & Cuthbertson 2001).	H	MH
Dispersal			
14. Number of mechanisms?	Known to be dispersed by clinging to sheep, furred animals, bags, clothing, water, contaminated gravel and soil (Parsons & Cuthbertson 2001).	MH	MH

Invasiveness Assessment Record

Scientific name: *Ambrosia tenuifolia*

Common Name: lacy ragweed

QUESTION	COMMENTS	RATING	CONFIDENCE
15. How far do they disperse?	Spreads 'readily over long distances'. Hull provides buoyancy (Parsons & Cuthbertson 2001). Assume likely that some of the propagules will disperse greater than 1km.	H	MH

References cited:

Department of Natural Resources and Mines 2005, *Annual ragweed: Ambrosia artemisiifolia*, Department of Natural Resources and Mines, Brisbane, viewed 08 Nov 2005, <http://www.nrm.qld.gov.au/factsheets/pdf/pest/pp7.pdf>

Parsons, W T & Cuthbertson, E G 2001, *Noxious weeds of Australia*, 2nd ed., CSIRO Publishing, Collingwood.

Schmoll, J.T., Regnier, E.E. & Harrison, S. K. 2004, *Giant ragweed interference among cropping systems*, [abstract]. North Central Weed Science Society Proceedings. vol. 59, p. 162, viewed 08 Nov 2005, <http://www.ncwss.org/proceed/2004/proc04/abstracts/098.pdf>

Revisions

Date	Revised by	Revision

Present distribution of *Ambrosia tenuifolia* in Victoria

Scientific name: *Ambrosia tenuifolia* Sprengel

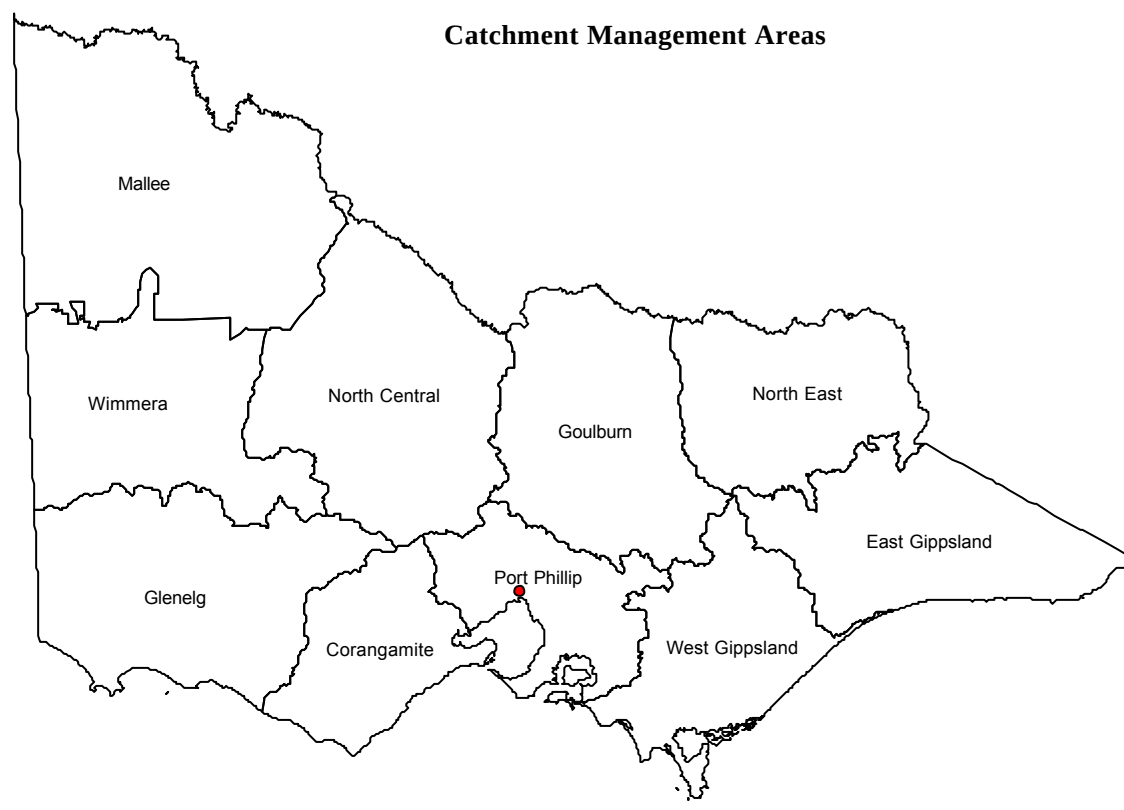
Common name(s): lacy ragweed

Status:

Habitat:

Subhumid temperate regions, principally on lighter soils in open areas, occurring as a weed of roadsides, railway reserves, sand dunes, cultivated fields, stubble paddocks, degraded pastures and waste places. Native to North America. Now found in North and Central Coasts, and Central Tablelands and South Western Slopes of NSW. Also found in Melbourne and Adelaide areas (Parsons & Cuthbertson 2001).

Present distribution with CMA boundaries



Potential distribution of *Ambrosia tenuifolia* in Victoria

Scientific name: *Ambrosia tenuifolia* Sprengel

Common name(s): lacy ragweed

Status:

Habitat:

Subhumid temperate regions, principally on lighter soils in open areas, occurring as a weed of roadsides, railway reserves, sand dunes, cultivated fields, stubble paddocks, degraded pastures and waste places. Native to North America. Now found in North and Central Coasts, and Central Tablelands and South Western Slopes of NSW. Also found in Melbourne and Adelaide areas (Parsons & Cuthbertson 2001).

Potential distribution produced from CLIMATE modelling refined by applying suitable landuse and vegetation type overlays with CMA boundaries

MAP OVERLAYS USED.

Land Use:

Pasture dryland

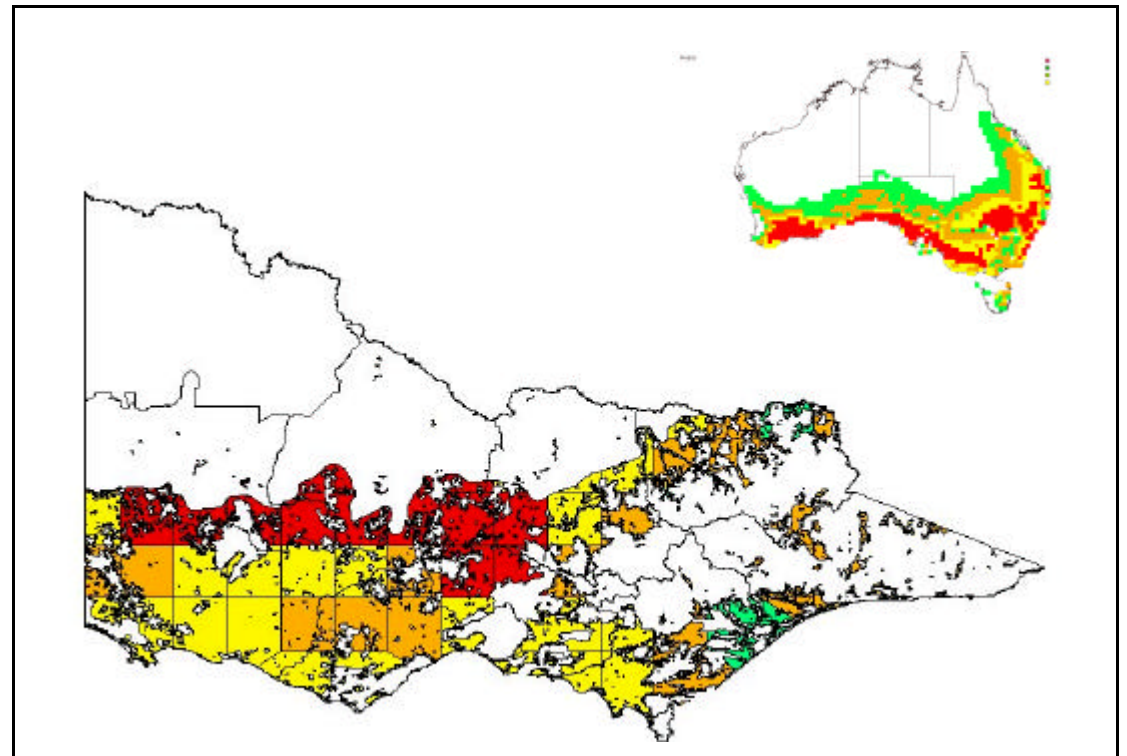
Broad vegetation types

Coastal scrubs and grassland; coastal grassy woodland; grassland; plains grassy woodland

Colours indicate possibility of *Ambrosia tenuifolia* infesting these areas.

 Red	= Very high	 Yellow	= High
 Orange	= Medium	 Green	= Likely

In the non-coloured areas the plant is unlikely to establish as the climate, soil or landuse is not presently suitable.



Impact Assessment Record

Scientific name: *Ambrosia tenuifolia*

Common Name: lacy ragweed

QUESTION	COMMENTS	RATING	CONFIDENCE
Social			
1. Restrict human access?	Grows between 30 to 60 cm high . Forms dense colonies but unlikely to have impact on human access (Parsons & Cuthbertson 2001).	L	MH
2. Reduce tourism?	Most species are 'so ordinary in appearance that they are rarely noticed despite their abundance'. All species noted for allergens (Parsons & Cuthbertson 2001). Some recreational uses affected.	MH	MH
3. Injurious to people?	'Most important hay-fever producing plant in North America'. All species are noted for their allergens and are a major contributor to hay fever in US, with some places advertising as 'ragweed free' (Parsons & Cuthbertson 2001). Also associated with asthma and dermatogenic properties. Major component in allergies.	MH	MH
4. Damage to cultural sites?	Not known to cause structural damage. Little or negligible effect on aesthetics.	L	MH
Abiotic			
5. Impact flow?	Terrestrial species (Parsons & Cuthbertson 2001).	L	MH
6. Impact water quality?	Terrestrial species (Parsons & Cuthbertson 2001).	L	MH
7. Increase soil erosion?	Plants have 'creeping runner-like roots' (Parsons & Cuthbertson 2001). Aerial growth dies off but unlikely that the species would contribute to large-scale soil erosion.	L	MH
8. Reduce biomass?	Occurs principally in open areas or waste lands (Parsons & Cuthbertson 2001). Likely that biomass would slightly increase.	L	MH
9. Change fire regime?	Herbaceous plant (Parsons & Cuthbertson 2001) so assume that it would have small or negligible effect on fire risk.	L	MH
Community Habitat			
10. Impact on composition (a) high value EVC	EVC=Plains Grassy Woodland (E), CMA=Glenelg-Hopkins, Bioreg.=Dundas Tablelands, CLIMATE=VH. Weed doesn't occur in healthy, well-established ecosystems. Occurs mostly in open, disturbed areas where less than 3 strata are present (Parsons & Cuthbertson 2001). Very little displacement of any indigenous species.	L	MH
(b) medium value EVC	EVC=Coastal Alkaline Scrub (D), CMA=West Gippsland, Bioreg=Gippsland Plain, CLIMATE=H. Weed doesn't occur in healthy, well-established ecosystems. Occurs mostly in open, disturbed areas where less than 3 strata are present (Parsons & Cuthbertson 2001). Very little displacement of any indigenous species.	L	MH
(c) low value EVC	EVC=Coastal Tussock Grassland (LC), CMA=West Gippsland, Bioreg.=Gippsland Plain, CLIMATE=H. Weed doesn't occur in healthy, well-established ecosystems. Occurs mostly in open, disturbed areas where less than 3 strata are present (Parsons & Cuthbertson 2001). Very little displacement of any indigenous species.	L	MH
11. Impact on structure?	Weed doesn't occur in healthy, well-established ecosystems. Occurs mostly in open, disturbed areas where less than 3 strata are present (Parsons & Cuthbertson 2001). Usually only affecting one of the strata.	L	MH

Impact Assessment Record

Scientific name: *Ambrosia tenuifolia*

Common Name: lacy ragweed

QUESTION	COMMENTS	RATING	CONFIDENCE
12. Effect on threatened flora?	No information available.	MH	L
Fauna			
13. Effect on threatened fauna?	No information available.	MH	L
14. Effect on non-threatened fauna?	Tends to grow in ruderal sites so assume that there is no reduction in habitat/food/shelter for non threatened fauna spp. (Parsons & Cuthbertson 2001).	L	MH
15. Benefits fauna?	Lacy ragweed not documented to provide benefit to non-threatened fauna species.	H	MH
16. Injurious to fauna?	Not documented to be injurious to fauna species (Parsons & Cuthbertson 2001).	L	MH
Pest Animal			
17. Food source to pests?	Not documented to provide a food source to pest species.	L	MH
18. Provides harbor?	Not likely that it provides harbour for pest spp.	L	MH
Agriculture			
19. Impact yield?	Occurs in cultivated fields, stubble paddocks and degraded pastures but not documented to impact agricultural yield (Parsons & Cuthbertson 2001).	L	MH
20. Impact quality?	Not documented to impact quality of yield (Parsons & Cuthbertson 2001).	L	MH
21. Affect land value?	No information on whether or not the weed affects land value. Weed can be controlled by herbicides (Parsons & Cuthbertson 2001).	L	M
22. Change land use?	Weed can be controlled by herbicide (Parsons & Cuthbertson 2001). Often found on degraded lands. Assume no change in priority of land use.	L	MH
23. Increase harvest costs?	No documented evidence to suggest that harvest costs would increase due to the presence of lacy ragweed.	L	MH
24. Disease host/vector?	None evident.	L	MH

Impact Assessment Record

Scientific name: *Ambrosia tenuifolia*

Common Name: lacy ragweed

References cited:

Parsons, W T & Cuthbertson, E G 2001, *Noxious weeds of Australia*, 2nd ed., CSIRO Publishing, Collingwood.

Scott, R. 2001, 'Ragweed: *Ambrosia artemisiifolia*', *Progressive Farmer*, vol. 116, no. 4, p. 80, Birmingham, viewed: 07 Nov 2005, Proquest Database.

Revisions

Date	Revised by	Revision

Invasiveness Assessment Record

Scientific name: *Annona glabra* L.

Common Name: pond apple

QUESTION	COMMENTS	RATING	CONFIDENCE
Establishment			
1. Germination requirements?	Germination can occur throughout the year, though germination rates are highest after periods of rainfall (ARMCANZ 2000).	H	MH
2. Establishment requirements?	“Seedlings require moist to wet, generally well lit conditions.” Low light levels restrict seedling growth as does waterlogging. Requires access to light and moisture, but does not tolerate inundation (ARMCANZ 2000).	MH	MH
3. How much disturbance is required?	“Disturbance can play an important part in encouraging infestations of pond apple.” Canopy openings due to severe storms can stimulate germination and seedling growth. Unlikely to establish under deep rainforest canopy; favours estuaries and floodplains where plenty of light and moisture occur (ARMCANZ 2000).	ML	MH
Growth/Competitive			
4. Life form?	Small semi-deciduous tree to 6 metres (15 under optimal conditions) (ARMCANZ 2000). Other lifeform.	L	MH
5. Allelopathic properties?	None described in ARMCANZ (2000).	L	MH
6. Tolerates herb pressure?	The plant is not documented as eaten by fauna or domesticated stock. Animals such as pigs and birds eat the fruit (ARMCANZ 2000). No herbivory pressure.	H	MH
7. Normal growth rate?	‘Seedlings grow rapidly to form dense stands that shade out native grasses and sedges’ (NRM 2001). Moderately rapid growth equal to similar competitive spp.	MH	M
8. Stress tolerance to frost, drought, w/logg, sal. etc?	Commonly found in estuarine situations⇒salt tolerant. Will withstand seasonal or tidal inundation, but not permanent waterlogging (e.g. wetlands, mangroves). Larger trees tolerate low intensity fires and, “[d]ense stands of pond apple lack sufficient fuel loads to sustain a fire.” (WTMT 2004). It has a high requirement for soil moisture, which limits its occurrence away from water sources. Unlikely to tolerate drought. Tolerant to salt and temporary inundation; tolerates low intensity fire.	MH	MH
Reproduction			
9. Reproductive system	Sexual reproduction; cross-pollination only (possibly by beetles)(ARMCANZ 2000).	L	MH
10. Number of propagules produced?	Each fruit contains ≈ 140 seeds; no of fruit produced not documented. However, it is estimated that seed banks of, “several thousand seeds m ² /year,” are common (ARMCANZ 2000). Assume 1000–2000 seeds per plant.	MH	MH
11. Propagule longevity?	Not known.	M	MH
12. Reproductive period?	Not documented. Plants reach reproductive maturity after two years and typically grow to 6 metres in height (WTMT 2004). Assume plants to live at least 3 to 10 years.	MH	MH

Invasiveness Assessment Record

Scientific name: *Annona glabra* L.

Common Name: pond apple

QUESTION	COMMENTS	RATING	CONFIDENCE
13. Time to reproductive maturity?	Plants reach reproductive maturity after 2 years (WTMT 2004).	ML	MH
Dispersal			
14. Number of mechanisms?	Propagules spread by water, humans and native and feral animals. "Water is the main dispersal agent for both pond apple fruit and seed. Spread of seed by animals vectors is very minor compared to its dispersal by water (WTMT 2004).	MH	MH
15. How far do they disperse?	Under tidal influence, seed can be spread both up and downstream within a river. However, the major movement of seed is due to floodwater. It is also noted that ocean currents play a role in seed dispersal along the coast (WTMT 2004). Under these conditions seeds will be spread more than 1 kilometre.	H	MH

References cited:

Agriculture & Resource Management Council of Australia & New Zealand, Australian & New Zealand Environment & Conservation Council and Forestry Ministers, (ARMCANZ), 2000, *Weeds of national significance, pond apple (Annona glabra) strategic plan*, National Weeds Strategy Executive Committee, Launceston.

Department of Natural Resources and Mines, 2001, Pond apple, *Annona glabra*, NRM facts series PP58, Queensland State Government.

Global Invasive Species Database, *Annona glabra*. Online—<http://www.issg.org/database/species/ecology.asp?si=187&fr=1&sts=> Viewed 27 July 2005

Wet Tropics Management Trust (WTMT), 2004, 'Adaptive management: pond apple control in the catchments of the Russell-Mulgrave and Tully-Murray river systems', Queensland State Government. Online: http://www.wettropics.gov.au/mwha/mwha_pdf/PondAppleReport.pdf viewed 30 July 2005

Revisions

Date	Revised by	Revision

Present distribution of *Annona glabra* in Victoria

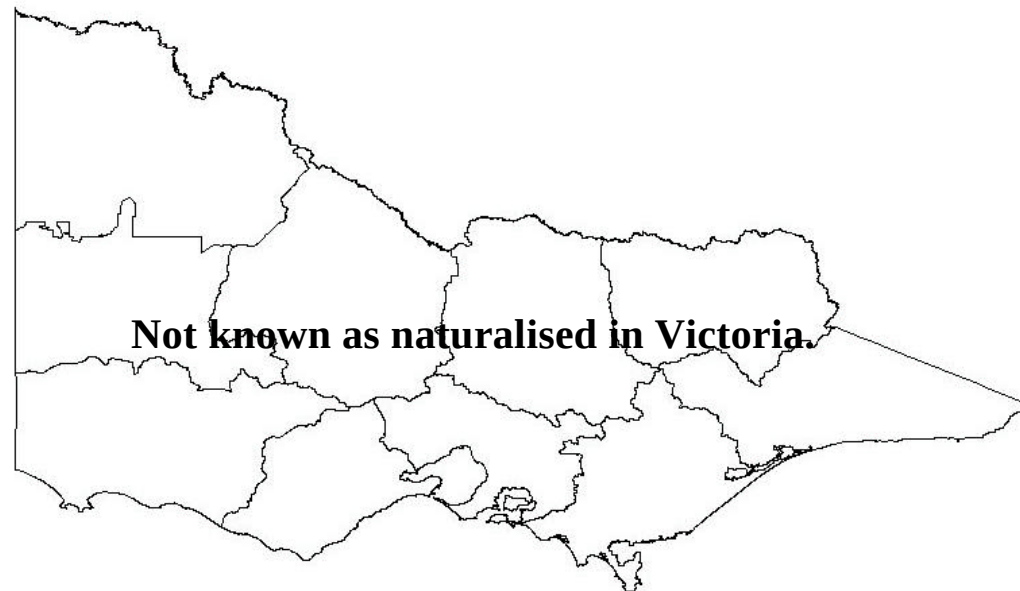
Scientific name: *Annona glabra* L.

Common name(s): Pond apple

Status:

Habitat:

In Australia it occurs on creek and river banks and farm drainage systems, wetlands and mangrove swamps, and the high tide area of the littoral zone on beaches (Land Protection, 2001).



Potential distribution of *Annona glabra* in Victoria

Scientific name: *Annona glabra* L.

Common name(s): Pond apple

Status:

Habitat:

In Australia it occurs on creek and river banks and farm drainage systems, wetlands and mangrove swamps, and the high tide area of the littoral zone on beaches (Land Protection, 2001).

Potential distribution produced from CLIMATE modelling refined by applying suitable landuse and vegetation type overlays with CMA boundaries

MAP OVERLAYS USED.

Land Use:

Irrigated pasture

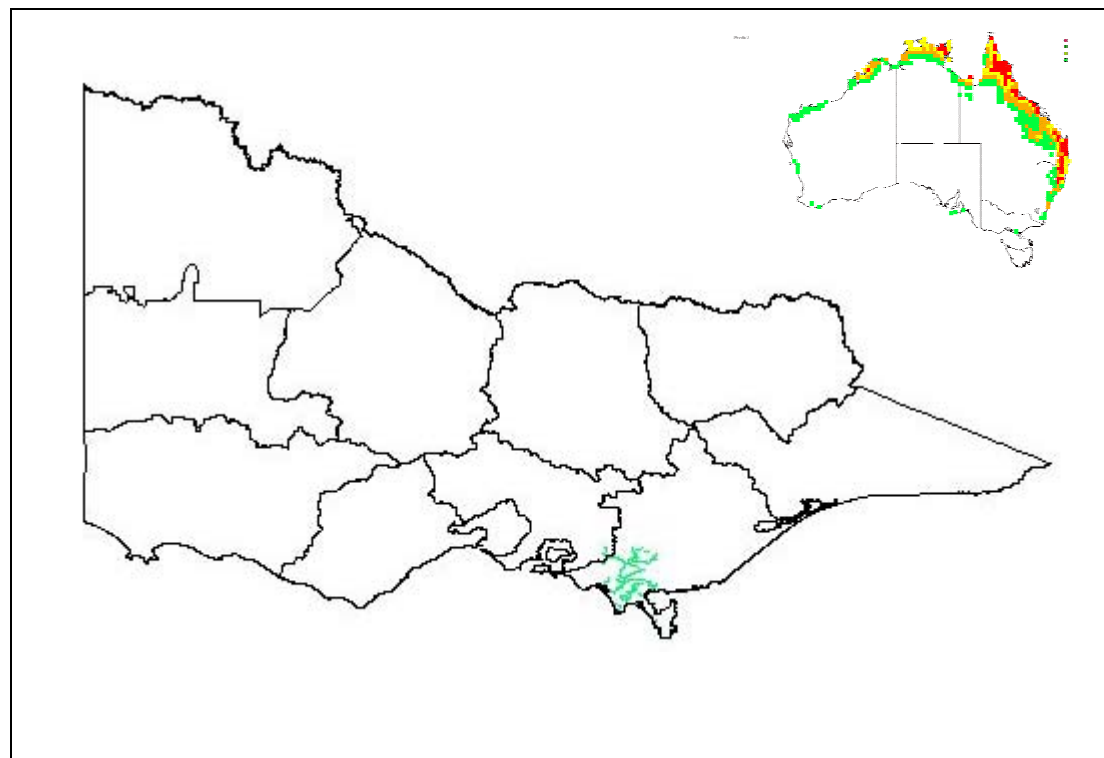
Broad vegetation types

Riverine grassy woodland, swamp scrub, riparian forest

Colours indicate possibility of *Annona glabra* infesting these areas.

 Red	= Very high	 Yellow	= High
 Orange	= Medium	 Green	= Likely

In the non-coloured areas the plant is unlikely to establish as the climate, soil or landuse is not presently suitable.



Impact Assessment Record

Scientific Name: *Annona glabra*

Common name: pond apple

QUESTION	COMMENTS	RATING	CONFIDENCE
Social			
1. Restrict human access?	A semi-deciduous tree 12 – 15 metres tall, occurring on creek banks, wetlands, mangrove communities & high tide litter zones on beaches (NRM 2001). ‘Thickets of pond apple restrict access’ (ARMCANZ 2000).	MH	MH
2. Reduce tourism?	‘Thickets of pond apple restrict access and impair outlooks and the general variety of the coastal recreational experience’ (ARMCANZ 2000).	H	MH
3. Injurious to people?	“...pond apple was introduced to Australia as grafting stock for custard apple. In its native America pond apple fruit has some commercial use” (NRM 2001). No toxic principle or physical properties likely to cause injury.	L	M
4. Damage to cultural sites?	Occurs mostly in riparian or wetland areas subjected to regular natural disturbance. Not documented to occur in areas of cultural significance (WTMT 2004). Where it may occur, dense infestations (approaching a monoculture) it would present a moderate negative visual impact.	ML	MH
Abiotic			
5. Impact flow?	Terrestrial species. “It grows in fresh, brackish and even saline waters. The plant will not survive, however, in areas that are permanently inundated” (ARMCANZ 2000). Due to its dependence on a high water supply, it is found in riparian areas, floodplains and the margins of wetland areas. In such areas a dense infestation may affect the watercourse by narrowing the channel or reducing the size of the waterbody (WTMT 2004).	ML	MH
6. Impact water quality?	Not documented to affect water quality. Does not withstand permanent inundation (ARMCANZ 2000).	L	MH
7. Increase soil erosion?	A semi-deciduous tree that in open areas forms dense stands (NRM 2001). Unlikely to contribute to soil erosion.	L	M
8. Reduce biomass?	“Pond apple can establish as a dense understorey that suppresses other growth and under favourable conditions can replace mature stands of paperbark with a monoculture forest of pond apple” (NRM 2001). Suppression of other species may result in slight reduction of biomass.	MH	M
9. Change fire regime?	“Time between fires is lengthened due to the reduction in understorey in infested areas” (ARMCANZ 2000). Does not contribute to an increase in fire risk.	L	MH
Community Habitat			
10. Impact on composition (a) high value EVC	Basin=South Gippsland (ISC=very poor-moderate); CMA=West Gippsland; CLIMATE potential=L. Therefore no high value EVC exists.	L	H
(b) medium value EVC	All Victorian waterbodies are presumed to be high value EVCs.	L	H
(c) low value EVC	All Victorian waterbodies are presumed to be high value EVCs.	L	H

Impact Assessment Record

Scientific Name: *Annona glabra*

Common name: pond apple

QUESTION	COMMENTS	RATING	CONFIDENCE
11. Impact on structure?	"Pond apple forms a dense understorey/sub-canopy, replacing ferns, grasses, shrubs and sedges and prevents tree regeneration" (ARMCANZ 2000). "Creeks may become muddy monocultures" (NRM 2001). Major effect on all strata in some situations.	H	MH
12. Effect on threatened flora?	This species is not documented as posing an additional risk to threatened flora.	MH	L
Fauna			
	COMMENTS	RANKING	
13. Effect on threatened fauna?	This species is not documented as posing an additional risk to threatened fauna.	MH	L
14. Effect on non-threatened fauna?	Dense infestations would alter the habitat for native fauna. The plant may provide suitable shelter/nesting sites, but food source is radically altered due to impacts on plant diversity (NRM 2001). Possible serious reduction in local faunal populations.	MH	M
15. Benefits fauna?	The fruit is a food source to some fruit-eating animals such as the cassowary and flying foxes (ARMCANZ 2000).	MH	MH
16. Injurious to fauna?	Not known to be harmful.	L	MH
Pest Animal			
17. Food source to pests?	The fruit is known as a food source to native fauna. In Queensland feral pigs spread the seed (ARMCANZ 2000).	MH	MH
18. Provides harbor?	May provide harbour to minor pest species such as birds (NRM 2001).	ML	M
Agriculture			
19. Impact yield?	Not known as a weed of agriculture (ARMCANZ 2000).	L	MH
20. Impact quality?	Not known as a weed of agriculture (ARMCANZ 2000).	L	MH
21. Affect land value?	Not known as a weed of agriculture (ARMCANZ 2000).	L	MH
22. Change land use?	Not known as a weed of agriculture (ARMCANZ 2000).	L	MH
23. Increase harvest costs?	Not known as a weed of agriculture (ARMCANZ 2000).	L	MH
24. Disease host/vector?	Not known to be a host or vector of disease for agriculture (ARMCANZ 2000).	L	MH

Impact Assessment Record

Scientific Name: *Annona glabra*

Common name: pond apple

References cited:

Agriculture and Resource Management Council of Australia & New Zealand, Australian & New Zealand Environment & Conservation Council and Forestry Ministers, 2000, *Weeds of National Significance Pond Apple (Annona glabra) Strategic Plan*. National Weeds Strategy Executive Committee, Launceston.

Department of Natural Resources and Mines, (NRM), 2001, *Pond Apple*, Annona glabra. (PP58), State of Queensland. Available: <http://www.nrm.qld.gov.au/factsheets/pdf/pest/PP58.pdf> Accessed 11/07/03

Thorp, JR & Lynch, R, 2000, *The Determination of Weeds of National Significance*, National Weeds Strategy Executive Committee, Launceston.

Wet Tropics Management Trust (WTMT), 2004, 'Adaptive management: pond apple control in the catchments of the Russell-Mulgrave and Tully-Murray river systems', Queensland State Government. Online: http://www.wetropics.gov.au/mwha/mwha_pdf/PondAppleReport.pdf viewed 30 July 2005

Revisions

Date	Revised by	Revision

Invasiveness Assessment Record

Scientific name: *Anredera cordifolia*

Common Name: madeira vine

QUESTION	COMMENTS	RATING	CONFIDENCE
Establishment			
1. Germination requirements?	'[Seeds] appear to germinate from only a few millimetres deep, and have only been found in well lit areas' (Swarbrick 1999). Prefers warm, damp or seasonally moist locations (Muyt 2001). 'Mature aerial tubers drop off the plant and either sprout into tuberlings immediately ..' (Helensburgh and District Landcare n.d.). Opportunistic germinator.	H	MH
2. Establishment requirements?	'Regrowth from vegetative propagules is faster [and more common] than the growth of seedlings, and can occur in dense shade under existing infestations of Madeira vine.' Shade-tolerant vine (Swarbrick 1999). Although prefers sun, can establish under moderate canopy.	MH	MH
3. How much disturbance is required?	Found in 'dry coastal vegetation, damp sclerophyll forest, riparian and outcrop vegetation, cliff faces, rail embankments, rainforest edges, tall open forest, gardens and waste places' (Blood 2002). Thrives in moist sunny sites such as riverbanks and gully edges (Eurobodalla Shire Council 2003). Can establish in minor disturbed natural ecosystems.	MH	MH
Growth/Competitive			
4. Life form?	Succulent climbing vine (ISSG 200).	ML	MH
5. Allelopathic properties?	None described.	L	MH
6. Tolerates herb pressure?	Not known to be eaten by animals or insects. No known biocontrol agents in Australia or New Zealand. Has even be 'suspected of poisoning livestock' (Blood 2002).	H	MH
7. Normal growth rate?	'Can grow rapidly to 10m in one growing season' (Blood 2002). 'Aggressive vegetative growth which competes with and replaces other vegetation'. Growth can 'exceed 1m per week and up to 6m in a growing season'. (ISSG 2005). Although will outcompete other species, appears that has moderately rapid growth rate that will equal competitive species of same life form.	MH	MH
8. Stress tolerance to frost, drought, w/logg, sal. etc?	'Tolerates dry conditions, snow and frost (will die back to tuber and reshoot), salt, sand and frontal dunes.' 'Very drought-resistant' (Blood 2002). Highly tolerant to at least 2 (drought, salinity) and tolerant of another (frost). Susceptible to at least 1 (not described but no reference made to fire or waterlogging tolerance).	MH	MH
Reproduction			
9. Reproductive system	Vegetative – from dormant buds on tubers or sections of rhizome in the soil. Through 'rhizome, stem tubers, stem fragments and leaves, rarely seeds' (Swarbrick 1999). 'The production of seedlings by this serious environmental weed has not previously been recorded in Australia, and may help to explain its dispersal to new sites and areas' (Blood 2002). Has both male and female flowers but rarely produces sexually – although it can (ISSG 2005).	H	MH
10. Number of propagules produced?	'Reproduces prolifically from the production of multitudes of aerial tubers'. 'Thousands of small aerial tubers develop along stems and can remain viable on vines or on the ground for five to ten years' (Wilsons Creek Huonbrook Landcare 2003). 'There may be up to 1500 fallen aerial tubers per square metre' (Muyt 2001).	MH	MH

Invasiveness Assessment Record

Scientific name: *Anredera cordifolia*

Common Name: madeira vine

QUESTION	COMMENTS	RATING	CONFIDENCE
11. Propagule longevity?	'Thousands of small aerial tubers develop along stems and can remain viable on vines or on the ground for five to ten years' (Muyt 2001).	L	MH
12. Reproductive period?	'Thousands of small aerial tubers develop along stems and can remain viable on vines or on the ground for five to ten years' (Muyt 2001). Mature plant produces viable propagules for 10 years or more.	H	MH
13. Time to reproductive maturity?	'Growth commences during spring .. can grow rapidly up to 10m in one growing season' (Blood 2002). 'Aerial tubers develop in large numbers along the stems, break off readily and shoot once they touch soil' (Sutherland Shire Council 2003). No documented evidence regarding time to reach reproductive maturity.	M	MH
Dispersal			
14. Number of mechanisms?	The seeds 'may be dispersed by birds ... although the majority probably fall to the ground .. and are dispersed by the movement of soil and water' (Swarbrick 1999). 'Spread by contaminated and eroding soil, machinery, road clearing and water' (Blood 2002).	H	MH
15. How far do they disperse?	'Seedlings have been found well away from infestations of parent plants .. likely to have been through the gut of a bird ..' (Swarbrick 1999).	H	MH

References cited:

Blood, K. 2002, Weed watch warning: Madeira vine, *Anredera cordifolia*, *Under Control*, no. 20, pp. 10-11.

Eurobodalla Shire Council 2003, *Madeira vine or lamb's tail (Anredera cordifolia)*, Eurobodalla Shire Council, viewed 22 Nov 2005, <http://www.esc.nsw.gov.au/Weeds/Sheets/vines/V%20Madeira%20vine.htm>

Helensburgh and District Landcare n.d., *Madeira vine (Anredera cordifolia)*, Northern Illawarra Online, viewed 21 Nov 2006, <http://www.nio.net.au/helensburgh/landcare/weeds/madeiravine.html>

Invasive Species Specialist Group 2005, *Anredera cordifolia* (vine, climber), Global invasive species database, Invasive Species Specialist Group, Auckland, viewed: 21 Nov 2005, <http://www.issg.org/database/species/ecology.asp?si=776&fr=1&sts=>

Muyt, A. 2001, *Bush invaders of south-east Australia: A guide to the identification and control of environmental weeds found in south-east Australia*, R.G. & F.J. Richardson, Meredith.

Sutherland Shire Council 2003, *Weed facts: Anredera cordifolia – Madeira Vine*, Sutherland Shire Council, viewed 23 Nov 2005, [http://www.hazelhurst.com.au/ssc/rwpattach.nsf/viewasattachmentPersonal/WeedFact_MadeiraVine_FINAL.pdf/\\$file/WeedFact_MadeiraVine_FINAL.pdf](http://www.hazelhurst.com.au/ssc/rwpattach.nsf/viewasattachmentPersonal/WeedFact_MadeiraVine_FINAL.pdf/$file/WeedFact_MadeiraVine_FINAL.pdf)

Swarbrick, J. T. 1999, 'Seedling production by Madeira vine (*Anredera cordifolia*)', *Plant Protection Quarterly*, vol. 14, no. 1, pp. 38-39.

Weber, E. 2003, *Invasive plant species of the world: A reference guide to environmental weeds*, CABI Publishing, Wallingford.

Wilsons Creek Huonbrook Landcare 2003, *Anredera cordifolia*, Wilsons Creek Huonbrook Landcare, viewed 21 Nov 2005, <http://mullum.com.au/wilsonscreeklandcare/>

Revisions

Date Revised by Revision

Present distribution of *Anredera cordifolia* in Victoria

Scientific name: *Anredera cordifolia* (Ten.) Steenis

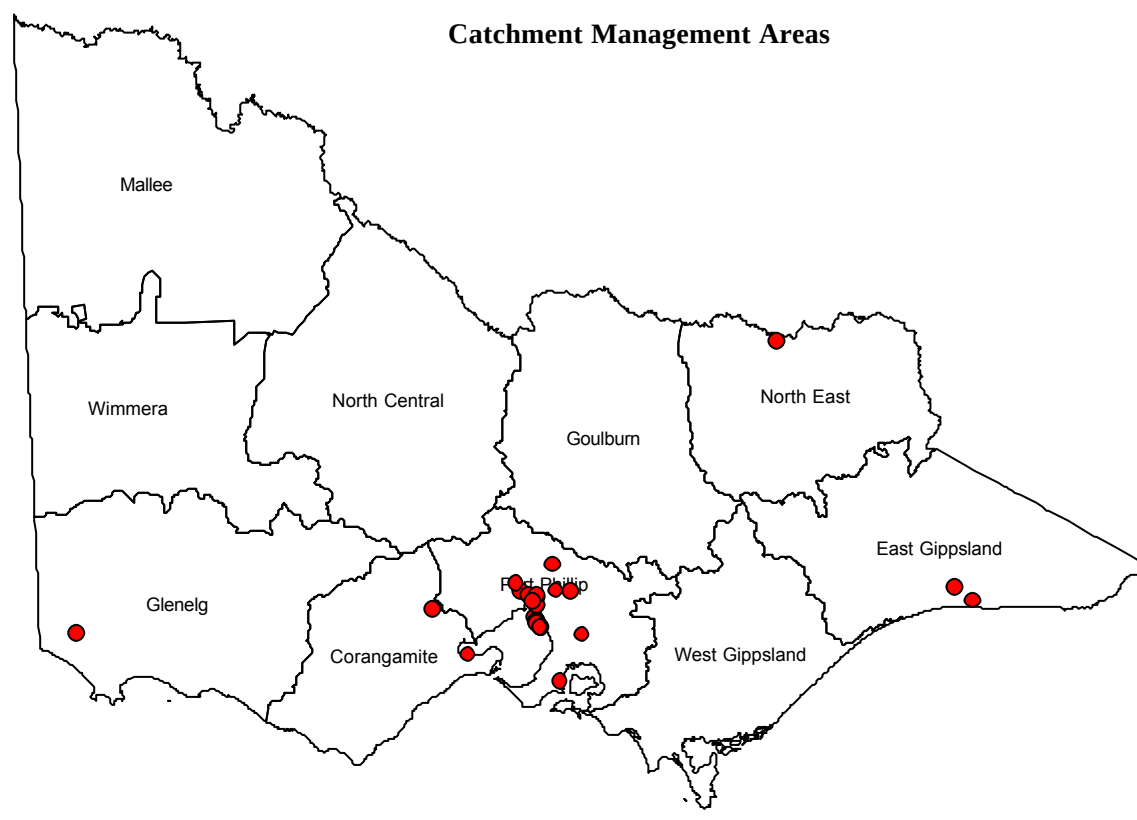
Common name(s): Madeira vine

Status:

Habitat:

Can be found invading riparian vegetation, the edges of rainforest, tall open forests, damp sclerophyll forests (ISSG 2005).

Present distribution with CMA boundaries



Potential distribution of *Anredera cordifolia* in Victoria

Scientific name: *Anredera cordifolia* (Ten.) Steenis

Common name(s): Madeira vine

Status:

Habitat:

Can be found invading riparian vegetation, the edges of rainforest, tall open forests, damp sclerophyll forests (ISSG 2005).

Potential distribution produced from CLIMATE modelling refined by applying suitable landuse and vegetation type overlays with CMA boundaries

MAP OVERLAYS USED.

Land Use:

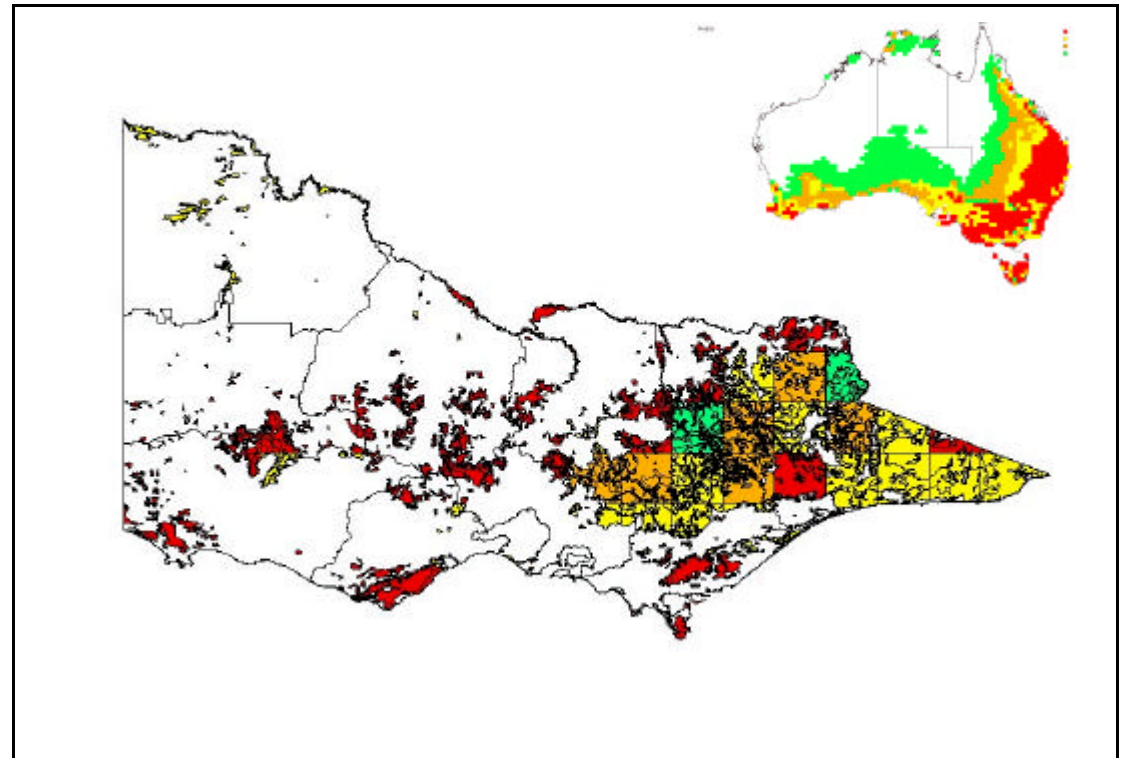
Broad vegetation types

Coastal scrubs and grasslands, coastal grassy woodland, lowland forest, moist foothill forest, montane moist forest, sub-alpine woodland, valley grassy forest, riverine grassy woodland, riparian forest.

Colours indicate possibility of *Anredera cordifolia* infesting these areas.

Red	= Very high	Yellow	= High
Orange	= Medium	Green	= Likely

In the non-coloured areas the plant is unlikely to establish as the climate, soil or landuse is not presently suitable.



Impact Assessment Record

Scientific Name: *Anredera cordifolia*

Common name: Madeira-vine, lamb's tail

QUESTION	COMMENTS	RATING	CONFIDENCE
Social			
1. Restrict human access?	'Has spread along the waterways and through forests' ' Because of its thick fleshy leaves and bunches of tubers, it is the heaviest of the problem vines and can smash the branches of trees by its weight' (Wilson's Creek Huonbrook Landcare 2003). Climbs vigorously over shrubs and trees with rope-like stems, up to a few centimetres in diameter (Muyt 2001). Would have a low nuisance value with the ability to impede individual access.	ML	MH
2. Reduce tourism?	'Starting to noticeably expand its range' (Environment Waikato 2002). 'It is highly visible, and receiving adverse comments from landholders..' (BREC 2004). Weed has the potential to have a minor effect on the aesthetics of the land.	ML	M
3. Injurious to people?	No known toxic principles.	L	M
4. Damage to cultural sites?	'Can completely smother indigenous vegetation and prevent natural regeneration' (Blood 2002). Weed could have a moderate visual effect.	ML	MH
Abiotic			
5. Impact flow?	Terrestrial species	L	MH
6. Impact water quality?	Terrestrial species	L	MH
7. Increase soil erosion?	Has tap and fibrous roots systems. 'Spreads over the ground, smothering native groundcover plants and preventing regeneration' (Eurobodalla Shire Council 2003). As it is an evergreen vine assume a low probability of large-scale soil movement.	L	M
8. Reduce biomass?	'Climbs over shrubs and trees, smothering and breaking them down. Also spreads over the ground, smothering native groundcover plants and preventing regeneration' (Eurobodalla Shire Council 2003). Likely that the biomass may increase.	L	M
9. Change fire regime?	Suppression of all indigenous vegetation may reduce fire risk. Thrives in moist habitats (Muyt 2001). Not likely to have an effect on the frequency or intensity of fires.	L	MH
Community Habitat			
10. Impact on composition (a) high value EVC	EVC=Sedgy Riparian Woodland (V); CMA=Corangamite; Bioreg=Otway Ranges; CLIMATE potential=VH. 'Capable of obliterating all indigenous vegetation. Vines climbing vigorously over shrubs and trees while trailing stems smother all ground-flora and prevent any regeneration' (Muyt 2001). Displaces all species in all layers.	H	MH
(b) medium value EVC	EVC= Riparian Scrub (D); CMA=Glenelg Hopkins; Bioreg=Glenelg Plains; CLIMATE potential=VH. 'Capable of obliterating all indigenous vegetation. Vines climbing vigorously over shrubs and trees while trailing stems smother all ground-flora and prevent any regeneration' (Muyt 2001). Displaces all species in all layers.	H	MH
(c) low value EVC	EVC= Riparian Forest (LC.); CMA=Corangamite; Bioreg=Otway Ranges; CLIMATE potential=VH. 'Capable of obliterating all indigenous vegetation. Vines climbing vigorously over shrubs and trees while trailing stems smother all ground-flora and prevent any regeneration' (Muyt 2001). Displaces all species in all layers.	H	MH

Impact Assessment Record

Scientific Name: *Anredera cordifolia*

Common name: Madeira-vine, lamb's tail

QUESTION	COMMENTS	RATING	CONFIDENCE
11. Impact on structure?	'By time, invaded forests become degraded and displaced with vine growth, preventing the establishment of native trees' (Weber 2003). 'Capable of obliterating all indigenous vegetation. Vines climbing vigorously over shrubs and trees while trailing stems smother all ground-flora and prevent any regeneration' (Muyt 2001). Capable of having a major effect on all layers.	H	MH
12. Effect on threatened flora?	'This part of the creek area is heavily infested with Madeira vine, camphor laurel and other weeds, while the vine is killing melaleucas and putting at risk rainforest trees' (BREC 2004). This species is not documented as posing an additional risk to threatened flora in Victoria.	MH	M
Fauna			
13. Effect on threatened fauna?	This species is not documented as posing an additional risk to threatened fauna in Victoria.	MH	L
14. Effect on non-threatened fauna?	In Queensland, an area which is heavily infested with weeds including <i>Anredera cordifolia</i> 'needs an urgent upgrade ... to provide access for fauna and facilitation of movement' (BREC 2004). Suggests that the weed could have a minor impact upon wildlife corridors.	ML	M
15. Benefits fauna?	In a forest in NSW 'the Madeira vine... took over the exposed understorey, further impeding regeneration... Flying foxes found the increasing number of sun-warmed gaps one of the few places left ideally suited for them' (BCI 1987). Provides very little support to desirable species.	H	ML
16. Injurious to fauna?	'Suspected of poisoning livestock' (Blood 2002). No documented evidence to suggest that fauna would eat the weed. Unlikely to have an effect on indigenous fauna.	L	MH
Pest Animal			
17. Food source to pests?	'Suspected of poisoning livestock' (Blood 2002). Unlikely to provide a food source for pest animals.	L	MH
18. Provides harbor?	'Involved the total removal of exotic weeds [including <i>Anredera cordifolia</i>] from .. a riparian habitat, which harboured a high density of native rodent, <i>Uromys caudimaculatus</i> ' (Ward, Tucker & Wilson 2003). May provide harbour for minor pest spp.	ML	MH
Agriculture			
19. Impact yield?	Not known as a weed of agriculture.	L	MH
20. Impact quality?	Not known as a weed of agriculture. Not likely to impact upon agricultural quality.	L	MH
21. Affect land value?	Not known as a weed of agriculture. Unlikely that the weed would affect land value.	L	MH
22. Change land use?	Not known as a weed of agriculture. Unlikely that there will be a change in priority of land use.	L	MH
23. Increase harvest costs?	Not known as a weed of agriculture.	L	MH

Impact Assessment Record

Scientific Name: *Anredera cordifolia*

Common name: Madeira-vine, lamb's tail

QUESTION	COMMENTS	RATING	CONFIDENCE
24. Disease host/vector?	None evident	L	MH

References cited:

Bat Conservation International (BCI), 1987, 'Australia's flying foxes still need help', *BATS*, vol. 5, no. 3, pp. 7-8, viewed 22 Nov 2005,

<http://www.bonus.com/contour/bats/http@/www.batcon.org/batsmag/v5n3-7.html>

Brisbane Region Environment Council 2004, Rochedale area preliminary ecological protection report, Brisbane Region Environment Council, viewed 22 Nov 2005,

<http://brec.ozecol.org/news/current/RochedaleFinalJuly2004.html>

Blood, K. 2002, Weed watch warning: Madeira vine, *Anredera cordifolia*, *Under Control*, no. 20, pp. 10-11.

Environment Waikato 2002, Regional pest management strategy 2002 – 2007, Waikato Regional Council, viewed 22 Nov 2005,

<http://www.ew.govt.nz/policyandplans/rpmsintro/rpms2002/operative5.3.6.htm>

Eurobodalla Shire Council 2003, *Madeira vine or lamb's tail (Anredera cordifolia)*, Eurobodalla Shire Council, viewed 22 Nov 2005,

<http://www.esc.nsw.gov.au/Weeds/Sheets/vines/V%20Madeira%20vine.htm>

Muyt, A. 2001, *Bush invaders of south-east Australia: A guide to the identification and control of environmental weeds found in south-east Australia*, R.G. & F.J. Richardson, Meredith.

Ward, D., Tucker, N. and Wilson, J. 2003, 'Cost-effectiveness of revegetating degraded riparian habitats adjacent to macadamia orchards in reducing rodent damage', *Crop Protection*, vol. 22, no. 7, pp. 935-940, viewed 21 Nov 2005, Sciencedirect Database.

Weber, E. 2003, *Invasive plant species of the world: A reference guide to environmental weeds*, CABI Publishing, Wallingford.

Wilsons Creek Huonbrook Landcare 2003, *Anredera cordifolia*, Wilsons Creek Huonbrook Landcare, viewed 21 Nov 2005, <http://mullum.com.au/wilsonscreeklandcare>

Revisions

Date Revised by Revision

Invasiveness Assessment Record

Scientific name: *Asystasia gangetica* ssp *micrantha*

Common Name: Chinese violet

QUESTION	COMMENTS	RATING	CONFIDENCE
Establishment			
1. Germination requirements?	'In tropical climates plant growth is probably continuous, especially in moist conditions or following rainfall'. 'Forms roots when the nodes make contact with moist soil' (CRC for Australian Weed Management 2003). Opportunistic germinator.	H	M
2. Establishment requirements?	'Forms roots when the nodes make contact with moist soil'(CRC for Australian Weed Management 2003). 'Prefers full sun or part shade. Plants in deep shade do not thrive'. 'If established underneath a hedge it often comes up through the hedge by leaning its weak stems on the shrub's branches' (Whistler 2000 cited in PIER 2005). Although the weed prefers sun, can establish under a moderate canopy.	MH	MH
3. How much disturbance is required?	'Most infestations .. occur on vacant residential land, along fencelines and in neglected garden beds .. present along roadsides and on crown land' (CRC for Australian Weed Management 2003). Establishes in highly disturbed natural ecosystems.	ML	M
Growth/Competitive			
4. Life form?	A perennial creeper (CRC for Australian Weed Management 2003).	ML	M
5. Allelopathic properties?	None described.	L	M
6. Tolerates herb pressure?	Where <i>Asystasia gangetica</i> is present in Malaysia it has been found that 'strip-grazing sheep in a weed-infested rubber plantation markedly reduced weed height (to 10cm above the soil) after 3 grazing cycles. The sheep preferentially selected <i>Asystasia</i> spp. before passing on to other weeds ' (Abdullah 1985). 'High stocking rates (>6 sheep/ ha) resulted in a decrease in the proportion of palatable species, namely .. <i>Asystasia gangetica</i> ..' (Chong <i>et al</i> 1997). Consumed and recovers slowly.	ML	MH
7. Normal growth rate?	'.. a perennial creeper that grows rapidly' (CRC for Australian Weed Management 2003). Assume that weed has moderately rapid growth rate that will equal competitive species of the same life form.	MH	M
8. Stress tolerance to frost, drought, w/logg, sal. etc?	'Winter frosts kill the above-ground plant parts but plants regrow the following spring from basal shoots' (CRC for Australian Weed Management 2003). 'Found on coastal sandy soils' (Whistler 2000 cited in PIER 2005). 'It can withstand drought.'	MH	MH
Reproduction			
9. Reproductive system	Produces through seed and rhizomes (PIER 2005). Produces both sexually and vegetatively.	H	MH
10. Number of propagules produced?	Each seed capsule 'contain four flattened seeds'. 'High seed production' (CRC for Australian Weed Management 2003). No documentation on number of capsules per plant. Score medium.	M	M
11. Propagule longevity?	' seeds remain dormant for some months .. if the seed coat is removed, about 75% germinate' (Akamine 1947). Assume that seeds survive less than 5 years.	L	MH
12. Reproductive period?	' .. the plant dies back to ground level after most of the ripe capsules have released their seeds' (CRC for Australian Weed Management 2003). No documentation on the reproductive period of the plant. Score as medium.	M	M

Invasiveness Assessment Record

Scientific name: *Asystasia gangetica* ssp *micrantha*

Common Name: Chinese violet

QUESTION	COMMENTS	RATING	CONFIDENCE
13. Time to reproductive maturity?	'it grows rapidly following germination and throughout flowering and seed capsule production' (CRC for Australian Weed Management 2003). PIER (2005) states that can be grown as an annual.	H	MH
Dispersal			
14. Number of mechanisms?	'The main method of dispersal over long distances is by human activities, such as mining, gardening , landscaping and roadworks' Propagules can spread by light vehicular traffic (CRC for Australian Weed Management 2003).	MH	M
15. How far do they disperse?	'The main method of dispersal over long distances is by human activities, such as mining, gardening , landscaping and roadworks' (CRC for Australian Weed Management 2003). Without further documentation, assume few propagules will disperse greater than 1km but many will reach 200-1000m.	MH	M

References cited:

- Abdullah, R. 1985, 'Biological control of *Asystasia* by sheep grazing', *Planters' Bulletin*, Rubber Research Institute of Malaysia, no. 183, pp. 43-49. [Abstract in CAB Abstracts, ref. No. 19870704046]
- Akamine, E. K. 1947, 'Germination of *Asystasia gangetica* L. seed with special reference to the effect of age on the temperature requirement for germination', *Plant Physiology*, vol. 22, pp. 603-7. [Abstract in CAB Abstracts, ref. No. 19480301463]
- Chong, D.T., Tajuddin, I., Samat, M.S., Stur, W.W. & Shelton, H.M. 1997, 'Stocking rate effects o sheep and forage productivity under rubber in Malaysia', *Journal of Agricultural Science*, Cambridge, vol. 128, no. 3, pp. 339-346.
- CRC for Australian Weed Management 2003, *Weed Management guide: Chinese violet (Asystasia gangetica ssp. Micrantha)*, CRC for Australian Weed Management, viewed 25 Nov 2005, http://www.weeds.crc.org.au/documents/wmg_chinese_violet.pdf
- Pacific Islands Ecosystems at Risk 2005, *Asystasia gangetica: risk assessment*, United States Forest Service, Department of Agriculture, viewed 25 Nov 2005, http://www.hear.org/pier/species/asystasia_gangetica.htm

Revisions

Date	Revised by	Revision

Present distribution of *Asystasia gangetica* ssp. *micrantha* in Victoria

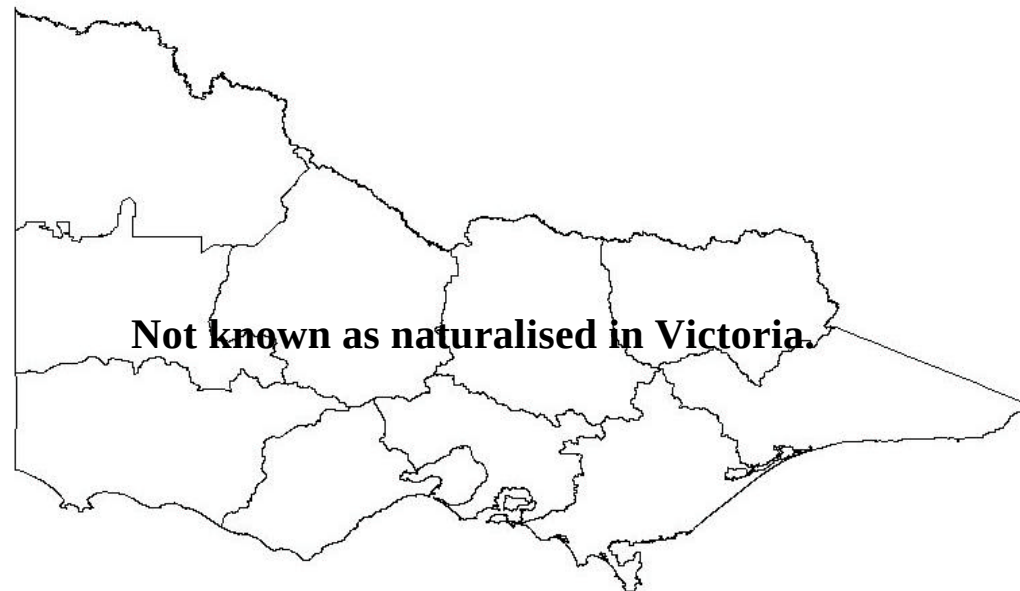
Scientific name: *Asystasia gangetica* (L.) T. Anderson subsp. *micrantha* (Nees) Ensermu

Common name(s): Chinese violet

Status:

Habitat:

Tropical and subtropical areas. Found primarily in urban areas or in low elevation, disturbed habitats. In Australia, most infestations occur on vacant residential land, along fencelines and in neglected garden beds or along roadsides and found on coastal sandy soils. In South-East Asia and Pacific Islands found in rubber, oil-palm, coffee and other crops (CRC for Australian Weed Management 2003).



Potential distribution of *Asystasia gangetica* ssp. *micrantha* in Victoria

Scientific name: *Asystasia gangetica* (L.) T. Anderson subsp. *micrantha* (Nees) Ensermu

Common name(s): Chinese violet

Status:

Habitat:

Tropical and subtropical areas. Found primarily in urban areas or in low elevation, disturbed habitats. In Australia, most infestations occur on vacant residential land, along fencelines and in neglected garden beds or along roadsides and found on coastal sandy soils. In South-East Asia and Pacific Islands found in rubber, oil-palm, coffee and other crops (CRC for Australian Weed Management 2003).

Potential distribution produced from CLIMATE modelling refined by applying suitable landuse and vegetation type overlays with CMA boundaries

MAP OVERLAYS USED.

Land Use:

Broadacre cropping, forest private plantation, forest public plantation, horticulture.

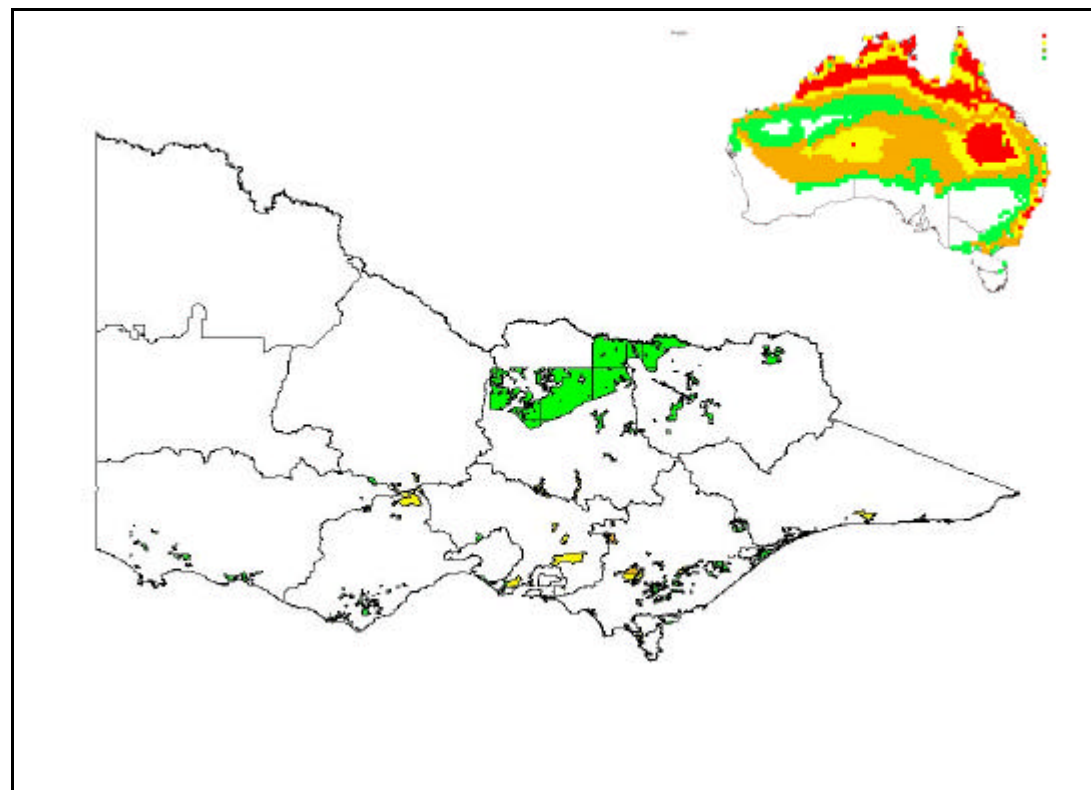
Broad vegetation types

Coastal scrubs and grassland; coastal grassy woodland

Colours indicate possibility of *Asystasia gangetica* infesting these areas.

 Red	= Very high	 Yellow	= High
 Orange	= Medium	 Green	= Likely

In the non-coloured areas the plant is unlikely to establish as the climate, soil or landuse is not presently suitable.



Impact Assessment Record

Scientific Name: *Asystasia gangetica* ssp *micrantha*

Common name: Chinese violet

QUESTION	COMMENTS	RATING	CONFIDENCE
Social			
Restrict human access?	'A perennial creeper .. grows up to 0.5m high alone but to 3m high on supporting vegetation'. Due to the preferred sites the weed grows 'on vacant residential land, along fencelines and in neglected garden beds' (CRC for Australian Weed Management 2003), it is likely to have only a minimal or negligible impact on human access.	L	M
Reduce tourism?	'Infestations have now been identified at .. Anna Bay and Fern Bay [NSW]. These infestations are spread over a distance of 9km and range in size from 2 square metres to several hectares' (CRC for Australian Weed Management 2003). Due to the smothering nature of the weed, it may have a minor effect on the aesthetics of the land.	ML	M
Injurious to people?	No toxic principle or physical properties likely to cause injury.	L	MH
Damage to cultural sites?	Not documented to occur in areas of cultural significance.	L	MH
Abiotic			
Impact flow?	Terrestrial species	L	MH
Impact water quality?	Terrestrial species	L	MH
Increase soil erosion?	'..makes a good ground cover, especially on slopes that need protection from erosion' (Whistler 2000 (cited in PIER 2005)). Unlikely to contribute to large scale soil movement.	L	MH
Reduce biomass?	'Smother other ground plants and displaces vegetation' (CRC for Australian Weed Management 2003). Likely that biomass may increase.	L	M
Change fire regime?	Grows well in drought areas and the plant will die off (CRC for Australian Weed Management 2003). However no evidence to suggest that it would change the frequency or intensity of fire. Assume small or negligible effect on fire risk.	L	M
Community Habitat			
Impact on composition (a) high value EVC	EVC= Coastal Banksia Woodland (V); CMA=Port Phillip; Bioreg=Gippsland Plain; CLIMATE potential=H. 'Can smother all vegetation in the herbaceous layer' (PIER 2005). Monoculture within the groundcover layer.	H	MH
(b) medium value EVC	No EVC found.	M	L
(c) low value EVC	EVC= Coastal tussock grassland (LC.); CMA=Port Phillip; Bioreg=Gippsland Plain; CLIMATE potential=H. 'Can smother all vegetation in the herbaceous layer' (PIER 2005). Monoculture within the groundcover layer.	H	MH
Impact on structure?	'Smother other ground plants and displaces vegetation' (CRC for Australian Weed Management 2003). 'Can smother all vegetation in the herbaceous layer' (PIER 2005). Would have a major effect on <60% of the floral strata.	MH	MH

Impact Assessment Record

Scientific Name: *Asystasia gangetica* ssp. *micrantha*

Common name: Chinese violet

QUESTION	COMMENTS	RATING	CONFIDENCE
Effect on threatened flora?	The potential for <i>Asystasia gangetica</i> ssp. <i>micrantha</i> to establish and naturalise in Victoria is highly unlikely due to ecoclimatic limitations. No impact on threatened flora in Victoria.	L	MH
Fauna			
Effect on threatened fauna?	The potential for <i>Asystasia gangetica</i> ssp. <i>micrantha</i> to establish and naturalise in Victoria is highly unlikely due to ecoclimatic limitations. No impact on threatened fauna in Victoria.	L	MH
Effect on non-threatened fauna?	As an environmental weed, 'it smothers other ground plants and displaces vegetation, which reduces the availability of habitat for native plants and animals' (CRC for Australian Weed Management 2003). May have a minor effect on fauna spp.	ML	M
Benefits fauna?	No evidence that the weed benefits indigenous fauna.	H	MH
Injurious to fauna?	Not known to be harmful.	L	MH
Pest Animal			
Food source to pests?	Not known as a food source to pest animals.	L	MH
Provides harbor?	Not known to provide harbour to pest spp.	L	MH
Agriculture			
Impact yield?	'It is a major weed overseas .. it infests plantations, particularly oil-palm crops, and competes effectively for soil nutrients, reducing productivity and increasing crop management costs' (CRC for Australian Weed Management 2003). Has the potential to have a minor impact on quantity of produce.	ML	M
Impact quality?	No evidence that the weed impacts on agricultural quality.	L	MH
Affect land value?	No evidence to suggest that the weed will affect land value.	L	MH
Change land use?	No evidence that the weed will cause a change in priority of land use.	L	MH
Increase harvest costs?	'It is a major weed overseas .. it infests plantations, particularly oil-palm crops, and competes effectively for soil nutrients, reducing productivity and increasing crop management costs' (CRC for Australian Weed Management 2003). Weed may lead to a minor increase in cost of harvesting.	M	M
Disease host/vector?	The weed provides host to minor disease (<i>Asystasia gangetica</i> mottle – potyvirus). Diagnostically susceptible host species include <i>Chenopodium amaranticolor</i> , <i>Nicotiana tabacum</i> , <i>Phaseolus vulgaris</i> and <i>Sesamum indicum</i> (VIDE 1996).	M	MH

Impact Assessment Record

Scientific Name: *Asystasia gangetica* ssp *micrantha*

Common name: Chinese violet

References cited:

CRC for Australian Weed Management 2003, Weed Management guide: Chinese violet (*Asystasia gangetica* ssp. *Micrantha*), CRC for Australian Weed Management, viewed 25 Nov 2005, http://www.weeds.crc.org.au/documents/wmg_chinese_violet.pdf

Pacific Islands Ecosystems at Risk 2005, *Asystasia gangetica: risk assessment*, United States Forest Service, Department of Agriculture, viewed 25 Nov 2005, http://www.hear.org/pier/species/asystasia_gangetica.htm

Virus Identification Data Exchange 1996, *Asystasia gangetica* mottle (?) potyvirus, Plant Viruses Online, viewed 25 Nov 2005, <http://www.image.fs.uidaho.edu/vide/descr050.htm>

Revisions

Date	Revised by	Revision

Invasiveness Assessment Record

Scientific name: *Barleria prionitis*

Common Name: barleria, porcupine flower

QUESTION	COMMENTS	RATING	CONFIDENCE
Establishment			
1. Germination requirements?	'Seeds germinate early in the wet season, following the first significant storms' (CRC for Australian Weed Management 2003). Requires seasonal rainfall for germination.	MH	M
2. Establishment requirements?	'Moderately intolerant of shade, growing in both full sunlight and under light forest canopies' (Francis 2002). Can establish under a moderate canopy.	MH	MH
3. How much disturbance is required?	'Most often found on roadsides, bluffs and bars above streams, overgrazed range, disturbed areas, and farmsteads' (Francis 2002). 'Grows well in tropical savanna country and along riverbanks' (CRC for Australian Weed Management 2003). Although common in highly disturbed natural ecosystems, can establish in relatively intact natural ecosystems also.	MH	MH
Growth/Competitive			
4. Life form?	Perennial shrub (Francis 2002)– other.	L	MH
5. Allelopathic properties?	None described in Francis 2002.	L	MH
6. Tolerates herb pressure?	'Spiny and generally ignored by cattle ' (Francis 2002). 'Unpalatable to stock' (CRC for Australian Weed Management 2003). Favoured by heavy grazing as not eaten by animals / insects.	H	MH
7. Normal growth rate?	'Dense stands eliminate most other ground vegetation. ..the species doesn't compete well in dense stands of tall grass.' 'Seedlings of porcupine flower grow slowly at first' (Francis 2002). Insufficient information. Score as medium.	M	MH
8. Stress tolerance to frost, drought, w/logg, sal. etc?	Grows on sandy soils. Susceptible to frost (CRC for Australian Weed Management 2003). Insufficient information to determine if tolerant of drought, waterlogging and / or fire. Score as medium.	M	M
Reproduction			
9. Reproductive system	'Reproduces by seed.' 'Many plants that are closely related to <i>barleria</i> are capable of vegetative reproduction .. <i>barleria</i> can probably also reproduce vegetatively' (CRC for Australian Weed Management 2003).	H	M
10. Number of propagules produced?	'Each seed capsule contains two fairly large flat seeds'. 'one plant producing up to hundreds of seeds in a season' (CRC for Australian Weed Management 2003).	ML	M
11. Propagule longevity?	'Forty-four percent of the seeds sown on commercial potting mix germinated between 13 and 77 days following sowing ..not known how long the seeds remain viable in the soil after being dropped but it is likely to be at least several years' (Francis 2002).	L	MH
12. Reproductive period?	'In Puerto Rico, these shrubs live about 4 years'. 'Can probably live for about ten years in good conditions' (CRC for Australian Weed Management 2003).	MH	M
13. Time to reproductive maturity?	'Not definitively known how old seedlings are before they first flower'. 'In Katherine plants do not flower until they are at least half a metre tall and their estimated age is one year' (CRC for Australian Weed Management 2003).	MH	M

Invasiveness Assessment Record

Scientific name: *Barleria prionitis*

Common Name: barleria, porcupine flower

QUESTION	COMMENTS	RATING	CONFIDENCE
Dispersal			
14. Number of mechanisms?	'.. animal vectors for seed dispersal are lacking' (Francis 2002). 'Infestations can move relatively quickly downhill, where seed transport may be aided by water'. '.. infestations in Australia have been traced back to escapees from gardens .. from garden waste that was dumped in bushland or transported on heavy machinery' (CRC for Australian Weed Management 2003).	MH	M
15. How far do they disperse?	'Natural regeneration generally occurs within 1 or 2 m of the parent plant'(Francis 2002). However, attached to machinery or spread along roadways, highly likely that some propagules will disperse greater than 1 km.	H	MH

References cited:

Centre for Plant Conservation 2002, 'Home garden plant turns menace in the Kimberley', *CPC News*, Royal Botanic Gardens, Sydney, no. 4, viewed 28 Nov 2005,

<http://www.rbgsyd.nsw.gov.au/>

CRC for Australian Weed Management 2003, *Weed management guide: barleria or porcupine flower – Barleria prionitis*, CRC for Australian Weed Management and Commonwealth Department of Environment and Heritage, viewed 28 Nov 2005, http://www.weeds.crc.org.au/documents/wmg_barleria.pdf

Francis, J.K. 2002, *Barleria prionitis* L. *Acanthaceae*, International Institute of Tropical Forestry, US Department of Agriculture, viewed 28 Nov 2005,

<http://www.fs.fed.us/global/iitf/Barleria%20prionitis.pdf>

Revisions

Date Revised by Revision

Present distribution of *Barleria prionitis* in Victoria

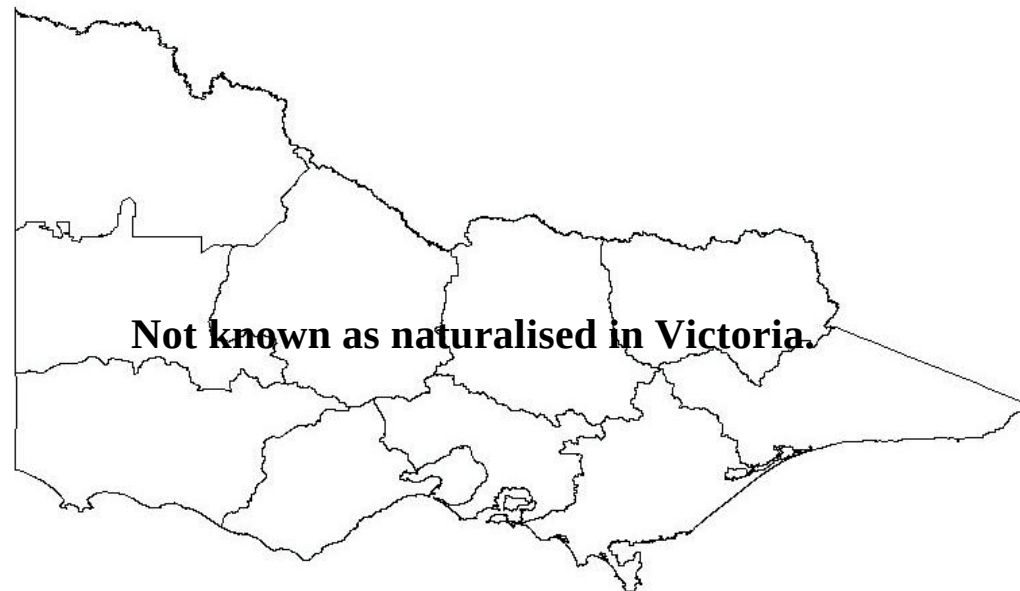
Scientific name: *Barleria prionitis* L.

Common name(s): Barleria, porcupine flower

Status:

Habitat:

Grows on a wide variety of soil types – prefers well-drained soils. In Australia Barleria grows well in tropical savanna country, along riverbanks and in grasslands. Found on rugged limestone outcrops with little soil cover. Found on sandy soil and grows well in disturbed areas including roadsides and overgrazed pastures. (CRC for Australian Weed Management 2003).



Potential distribution of *Barleria prionitis* in Victoria

Scientific name: *Barleria prionitis* L.

Common name(s): Barleria, porcupine flower

Status:

Habitat:

Grows on a wide variety of soil types – prefers well-drained soils. In Australia Barleria grows well in tropical savanna country, along riverbanks and in grasslands. Found on rugged limestone outcrops with little soil cover. Found on sandy soil and grows well in disturbed areas including roadsides and overgrazed pastures. (CRC for Australian Weed Management 2003).

Potential distribution produced from CLIMATE modelling refined by applying suitable landuse and vegetation type overlays with CMA boundaries

MAP OVERLAYS USED.

Land Use:

Pasture dryland
Pasture irrigation

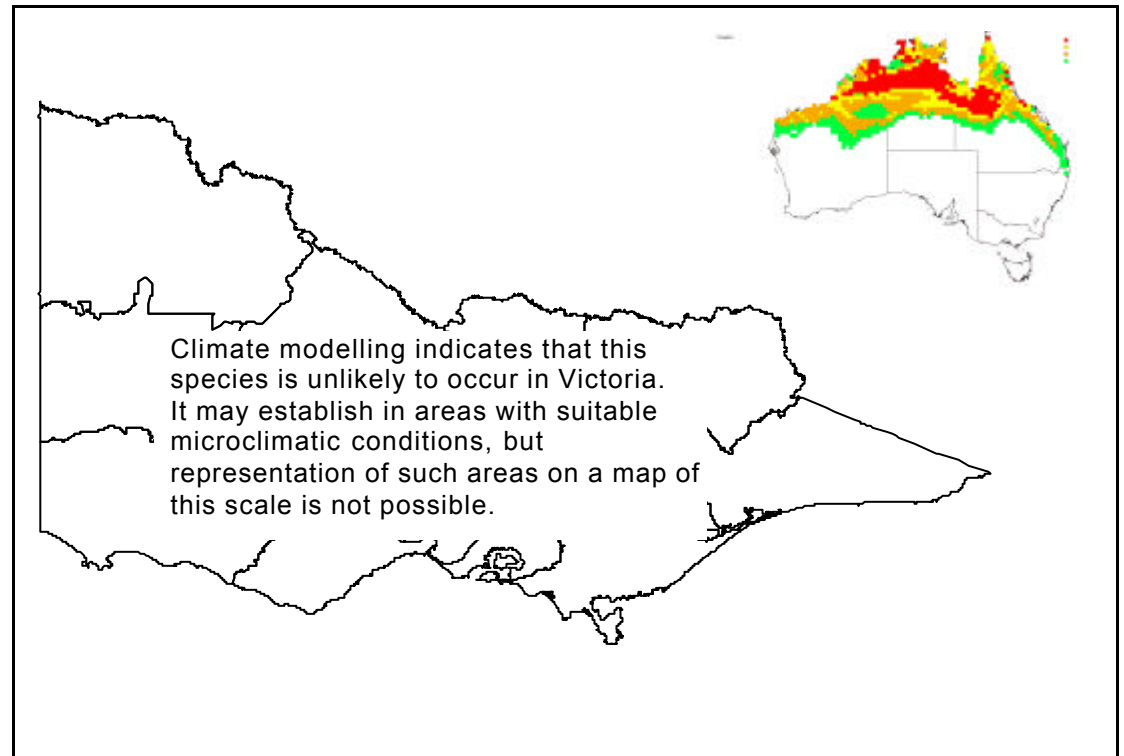
Broad vegetation types

Coastal scrubs and grassland; Grassland; Plains grassy woodland;
Herb-rich woodland; Riverine grassy woodland; Riparian forest

Colours indicate possibility of *Barleria prionitis* infesting these areas.

 Red	= Very high	 Yellow	= High
 Orange	= Medium	 Green	= Likely

In the non-coloured areas the plant is unlikely to establish as the climate, soil or landuse is not presently suitable.



Impact Assessment Record

Scientific Name: *Barleria prionitis*

Common name: barleria, porcupine flower

QUESTION	COMMENTS	RATING	CONFIDENCE
Social			
Restrict human access?	Grows up to 1.5m. May grow as a single plant or in large, tangled thickets. 'Thickets can impede the movement of stock, restrict access to waterways' (CRC for Australian Weed Management 2003). 'The prickly nature and dense thickets of the bush makes it impossible for wildlife, stock or humans to get through to waterways' (CPC 2002). Weed would have a high nuisance value.	MH	M
Reduce tourism?	Can 'reduce the aesthetic values of natural bushland' (CRC for Australian Weed Management 2003). Potential to have a minor effect on aesthetics.	ML	M
Injurious to people?	The plant has 5- to 20mm long spines (Francis 2002). Spines are present at certain times of years.	ML	MH
Damage to cultural sites?	Can 'reduce the aesthetic values of natural bushland' (CRC for Australian Weed Management 2003). Possible that the weed would have a moderate visual effect.	ML	M
Abiotic			
Impact flow?	Terrestrial species.	L	MH
Impact water quality?	Terrestrial species.	L	MH
Increase soil erosion?	Although defoliates annually during the dry season, it has a tap and lateral root system, branching in all directions which would help 'protect the soil against erosion' (Francis 2002). Unlikely to contribute to large-scale soil movement.	L	MH
Reduce biomass?	'Dense stands eliminate most other ground vegetation' (Francis 2002). Likely that biomass may increase.	L	MH
Change fire regime?	Weed dies off during the dry season and grows up to 1.5m. Can grow in grassland. Possible that the weed's dry matter would have a minor effect on the frequency or intensity of fire risk.	ML	M
Community Habitat			
Impact on composition (a) high value EVC	The potential distribution of <i>Barleria prionitis</i> excludes Victoria. No impact on EVCs in Victoria.	L	H
(b) medium value EVC	The potential distribution of <i>Barleria prionitis</i> excludes Victoria. No impact on EVCs in Victoria.	L	H
(c) low value EVC	The potential distribution of <i>Barleria prionitis</i> excludes Victoria. No impact on EVCs in Victoria.	L	H
Impact on structure?	'Dense stands eliminate most other ground vegetation' (Francis 2002). The weed would have a major effect on less than 60% of the floral strata.	MH	MH

Impact Assessment Record

Scientific Name: *Barleria prionitis*

Common name: barleria, porcupine flower

QUESTION	COMMENTS	RATING	CONFIDENCE
Effect on threatened flora?	The potential for <i>Barleria prionitis</i> to establish and naturalise in Victoria is highly unlikely due to ecoclimatic limitations. No impact on threatened flora in Victoria.	L	MH
Fauna			
Effect on threatened fauna?	The potential for <i>Barleria prionitis</i> to establish and naturalise in Victoria is highly unlikely due to ecoclimatic limitations. No impact on threatened fauna in Victoria.	L	MH
Effect on non-threatened fauna?	'The prickly nature and dense thickets of the bush makes it impossible for wildlife, stock or humans to get through to waterways' (CPC 2002). Weed may have a minor effect on fauna spp.	ML	M
Benefits fauna?	'Furnishes cover for wildlife' (Francis 2002). May provide some assistance in shelter to desirable species.	MH	MH
Injurious to fauna?	'Spiny and generally ignored by cattle' (Francis 2002). Spines are present at certain times of the year.	MH	MH
Pest Animal			
Food source to pests?	Not a known food source for pest animals.	L	MH
Provides harbor?	'Can provide refuge for feral animals' (CRC for Australian Weed Management 2003). May provide harbour for minor pest spp.	ML	M
Agriculture			
Impact yield?	'Thickets can impede the movement of stock, restrict access to waterways'. 'Infestations reduce the productivity of pastoral country' (CRC for Australian Weed Management 2003). May have a minor impact on carrying capacity of land.	ML	M
Impact quality?	Not a weed of cropping.	L	MH
Affect land value?	Primarily a weed of natural ecosystems. Unlikely to effect land value.	L	MH
Change land use?	Primarily a weed of natural ecosystems. Unlikely to cause a change in priority of land use.	L	MH
Increase harvest costs?	Not a weed of cropping.	L	MH
Disease host/vector?	None evident.	L	MH

Impact Assessment Record

Scientific Name: Barleria prionitis

Common name: barleria, porcupine flower

References cited:

Centre for Plant Conservation (CPC) 2002, 'Home garden plant turns menace in the Kimberley', *CPC News*, Royal Botanic Gardens, Sydney, no. 4, viewed 28 Nov 2005, <http://www.rbgsyd.nsw.gov.au/>

CRC for Australian Weed Management 2003, *Weed management guide: barleria or porcupine flower – Barleria prionitis*, CRC for Australian Weed Management and Commonwealth Department of Environment and Heritage, viewed 28 Nov 2005, http://www.weeds.crc.org.au/documents/wmg_barleria.pdf

Francis, J.K. 2002, *Barleria prionitis* L. *Acanthaceae*, International Institute of Tropical Forestry, US Department of Agriculture, viewed 28 Nov 2005, <http://www.fs.fed.us/global/iitf/Barleria%20prionitis.pdf>

Revisions

Date	Revised by	Revision

Invasiveness Assessment Record

Scientific name: *Bassia scoparia*

Common Name: kochia scoparia

QUESTION	COMMENTS	RATING	CONFIDENCE
Establishment			
1. Germination requirements?	Will not flower and set seed if temperature is less than 15.5°C. 'Most seed germinates in spring and early summer .. if conditions allow (late summer rains), seeds can also germinate from March to May' (State Noxious Weed Control Board 1999). Does require seasonal disturbances for germination.	MH	MH
2. Establishment requirements?	'Thrives in warm, low rainfall environments' (CRC for Australian Weed Management 2003). 'Competitiveness is limited under a closed canopy' (Fisher <i>et al</i> 2000). Not documented as to whether or not the weed can establish under a canopy and prefers open, bare environments.	ML	H
3. How much disturbance is required?	'In Colorado, was present in both logged forest and undisturbed, protected ponderosa-pine/Douglas fir forest' (Wali 1999, cited in CIPC 2003). 'Invades disturbed sites such as roadsides, railways and eroded banks, and also grows in crops, pastures and rangelands' (CRC for Australian Weed Management 2003). Although thrives in highly disturbed natural ecosystems, can also establish in relatively intact or only minor disturbed natural ecosystem.	MH	MH
Growth/Competitive			
4. Life form?	'A bushy annual' (CRC for Australian Weed Management 2003). Life form- other	L	M
5. Allelopathic properties?	'Litter has allelopathic properties that affect crop plants and kochia seedlings. ... Although it is allelopathic, the compounds appear to create autotoxicity that hastens its own demise' (CIPC 2003). 'Some degree of allelopathy' (University of Connecticut 2004).	ML	MH
6. Tolerates herb pressure?	In Western Australia a control program where 'high densities of sheep were used to provide extreme grazing pressure that caused defoliation of large plants and destruction of seedlings' (CRC for Australian Weed Management 2003). Under moderate herbivory pressure, assume plant would be capable of seed production.	MH	M
7. Normal growth rate?	'Grows rapidly through spring and summer.' 'Seedlings grow vigorously, outcompeting perennial species with their rapid growth' (State Noxious Weed Control Board 1999). 'Rapid coloniser in high light situations' (CRC for Australian Weed Management 2003). Rapid growth that will equal competitive species of same life form.	MH	MH
8. Stress tolerance to frost, drought, w/logg, sal. etc?	Very drought tolerant. Tolerant to saline soils. 'Seeds germinate in early spring because of frost tolerance' (State Noxious Weed Control Board 1999). Waterlogging tolerant. Highly resistant to at least 2 and not susceptible to more than one.	H	MH
Reproduction			
9. Reproductive system	Reproduces by seed only. Known to cross-pollinate but unknown whether it can self-pollinate (Csurhes & Edwards 1998).	ML	MH
10. Number of propagules produced?	'Typically produces around 14,600 seeds per plant' (State Noxious Weed Control Board 1999).	H	MH
11. Propagule longevity?	'Laboratory studies report germination rates of 76 percent or better'. 'Seeds buried in the soil have five percent viability after one year and zero percent after two years' (State Noxious Weed Control Board 1999). 'A small percentage of seeds may remain viable for two to four years' (CRC for Australian Weed	L	MH

Invasiveness Assessment Record

Scientific name: *Bassia scoparia*

Common Name: kochia scoparia

QUESTION	COMMENTS	RATING	CONFIDENCE
	Management 2003).		
12. Reproductive period?	Annual plant. 'Normally the time between germination and death is six to seven months' (CRC for Australian Weed Management 2003).	L	M
13. Time to reproductive maturity?	Annual plant (CIPC 2003).	H	MH
Dispersal			
14. Number of mechanisms?	Dispersed by wind and water (University of Connecticut 2004). Becomes a tumbleweed when mature (State Noxious Weed Control Board 1999).	MH	M
15. How far do they disperse?	When winds reach 25 miles per hour, stem breaks and plants tumble (State Noxious Weed Control Board 1999). 'Can spread up to several kilometres in a single year [by tumbling]' (CRC for Australian Weed Management 2003).	H	MH

References cited:

California Invasive Plant Council 2003, *Plant assessment form: Kochia scoparia*, California Exotic Pest Plant Council and Southwest Vegetation Management Association, viewed 29 Nov 2005, http://www.cal-ipc.org/file_library/20382.pdf

CRC for Australian Weed Management 2003, *Weed management guide: Kochia (Bassia scoparia)*, CRC for Australian Weed Management and the Commonwealth Department of the Environment and Heritage, viewed 29 Nov 2005, <http://www.deh.gov.au/biodiversity/invasive/publications/pubs/b-scoparia.pdf>

Fischer, A.J., Messersmith, C.G., Nalewaja, J.D. & Duysen, M.E. 2000, 'Interference between spring cereals and *Kochia scoparia* related to environment and photosynthetic pathways', *Agronomy Journal*, Vol. 92, pp. 173-181, viewed 29 Nov 2005, Science Direct database.

State Noxious Weed Control Board 1999, *Kochia (Kochia scoparia L.)*, Washington State, viewed 29 Nov 2005, http://www.nwcb.wa.gov/weed_info/Written_findings/Kochia_scoparia.html

University of Connecticut 2004, *Kochia scoparia*, Invasive Plant Atlas of New England, viewed 29 Nov 2005, <http://webapps.lib.uconn.edu/ipane/browsing.cfm?descriptionid=60>

Revisions

Date Revised by Revision

Present distribution of *Bassia scoparia* in Victoria

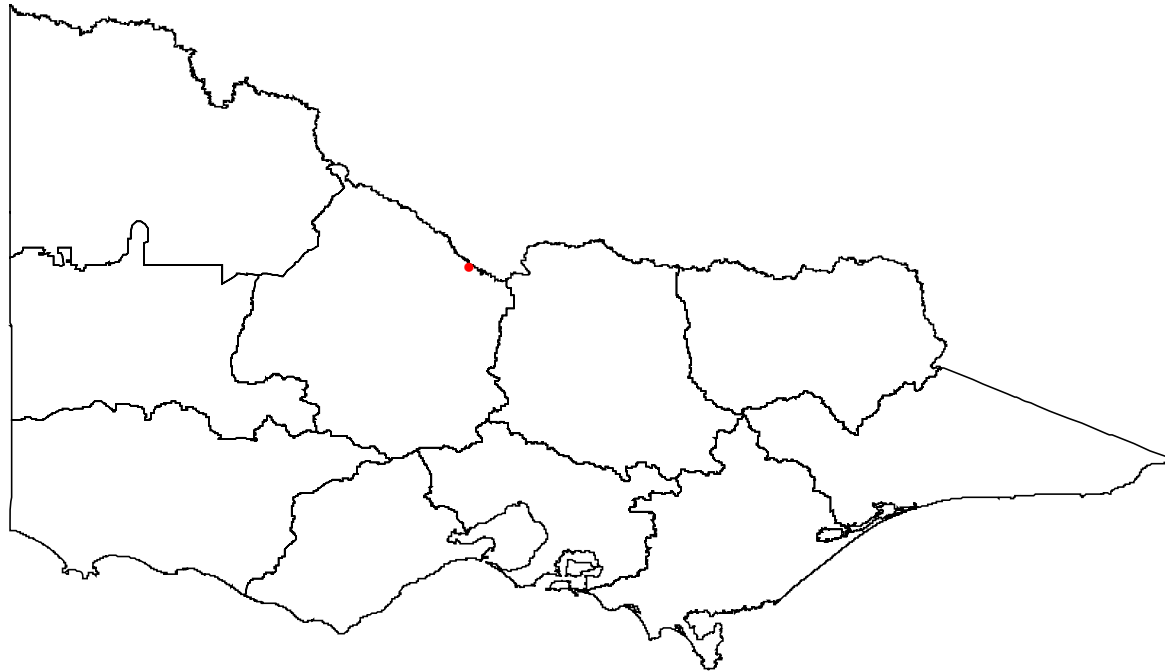
Scientific name: *Bassia scoparia* (L.) A.J. Scott

Common name(s): kochia

Status:

Habitat:

Grows well in climates with hot, sunny summers, and can receive as little as 150mm annual rainfall. Invades disturbed sites such as roadsides, railways and eroded banks and grows in crops, pastures and rangelands. Tolerant of saline soils.



Potential distribution of *Bassia scoparia* in Victoria

Scientific name: *Bassia scoparia* (L.) A.J. Scott

Common name(s): kochia

Status:

Habitat:

Grows well in climates with hot, sunny summers, and can receive as little as 150mm annual rainfall. Invades disturbed sites such as roadsides, railways and eroded banks and grows in crops, pastures and rangelands. Tolerant of saline soils.

Potential distribution produced from CLIMATE modelling refined by applying suitable landuse and vegetation type overlays with CMA boundaries

MAP OVERLAYS USED.

Land Use:

Broadacre cropping
Pasture dryland

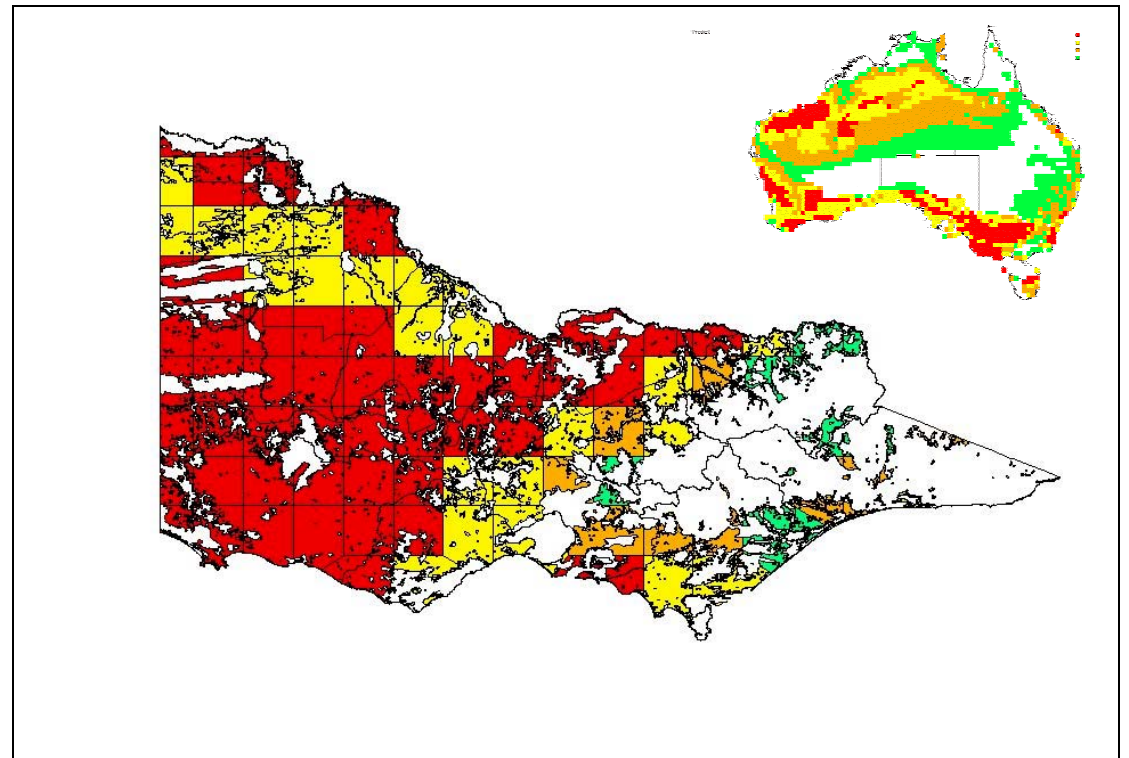
Broad vegetation types

Coastal scrubs and grassland; coastal grassy woodland; grassland;
plains grassy woodland; mallee; boinka-raak; mallee-woodland;
Wimmera / mallee woodland

Colours indicate possibility of *Bassia scoparia* infesting these areas.

Red	= Very high	Yellow	= High
Orange	= Medium	Green	= Likely

In the non-coloured areas the plant is unlikely to establish as the climate, soil or landuse is not presently suitable.



Impact Assessment Record

Scientific Name: Bassia scoparia

Common name: Kochia scoparia

QUESTION	COMMENTS	RATING	CONFIDENCE
Social			
Restrict human access?	Erect, much-branched stems from one to two metres long. Bush can grow up to 150cm in height (Noxious Weed Control Board 1999). May have a low nuisance value which impedes individual access.	ML	MH
Reduce tourism?	Possible that the weed will have a minor effect on aesthetics.	ML	MH
Injurious to people?	Causes 'asthma, hayfever and allergic rhinitis.' 'Common cause of sensitisation..' (All Allergy 1998). Mildly toxic at certain times of year.	ML	M
Damage to cultural sites?	Little or negligible effect on aesthetics or structure of cultural sites.	L	MH
Abiotic			
Impact flow?	Terrestrial species.	L	MH
Impact water quality?	Terrestrial species.	L	MH
Increase soil erosion?	'Has a main taproot [which can grow up to 5 metres] and network of finer roots.' 'Dead plants break off at the base and are blown by the wind as tumbleweeds (CRC for Australian Weed Management 2003). Although, 'can be used in revegetation programs for erosion control' as it can outcompete perennial species, chance of bare ground open to soil erosion is increased (Undersander <i>et al</i> 1990). Only low probability of large scale soil movement.	ML	H
Reduce biomass?	'Dense infestations could suppress recruitment of native ground cover plants and alter natural fire regime' (Csurhes & Edwards 1998). As replacing grasses, biomass may slightly increase.	L	MH
Change fire regime?	'Dense infestations could suppress recruitment of native ground cover plants and alter natural fire regime' (Csurhes & Edwards 1998). Plants die off during dry season. May have minor effect on intensity of fire.	ML	MH
Community Habitat			
Impact on composition (a) high value EVC	EVC= Parilla mallee (E); CMA=Mallee; Bioreg=Murray Mallee; CLIMATE potential=VH. 'Dense infestations could suppress recruitment of native ground cover plants and alter natural fire regime' (Csurhes & Edwards 1998). Monoculture within the groundcover layer.	H	MH
(b) medium value EVC	EVC= Grassy dry forest (D); CMA=Corangamite; Bioreg=Victorian Volcanic Plain; CLIMATE potential=VH. 'Dense infestations could suppress recruitment of native ground cover plants and alter natural fire regime' (Csurhes & Edwards 1998). Monoculture within the groundcover layer.	H	MH
(c) low value EVC	EVC= Coastal Tussock Grassland (LC); CMA=West Gippsland; Bioreg=Gippsland Plain; CLIMATE potential=VH. d. 'Dense infestations could suppress recruitment of native ground cover plants and alter natural fire regime' (Csurhes & Edwards 1998). Monoculture within the groundcover layer.H	MH	MH
Impact on structure?	'Dense infestations could suppress recruitment of native ground cover plants and alter natural fire regime' (Csurhes & Edwards 1998). Major effect on less than 60% of floral strata.	MH	MH

Impact Assessment Record

Scientific Name: Bassia scoparia

Common name: Kochia scoparia

QUESTION	COMMENTS	RATING	CONFIDENCE
Effect on threatened flora?	No information available.	MH	L
Fauna			
Effect on threatened fauna?	No information available.	MH	L
Effect on non-threatened fauna?	No documented effect on non-threatened fauna spp.	L	MH
Benefits fauna?	Weed not known to provide benefits to indigenous fauna.	H	MH
Injurious to fauna?	‘Contains high levels of oxalates, alkaloids and nitrates that can be toxic to a variety of grazing animals if large amounts are consumed’ (CRC for Australian Weed Management 2003). Toxic properties at certain times of the year.	MH	M
Pest Animal			
Food source to pests?	Not known to be a food source to pests.	L	MH
Provides harbor?	Not known to provide harbour to pests.	L	MH
Agriculture			
Impact yield?	Serious pest of late-maturing crops such as sorghum, soybeans and sugarbeets .. an effective competitor for light, nutrients and soil moisture, and can reduce crop yield’ (Noxious Weed Control Board 1999). ‘A weed that infests cereal crops in the Great Plains of the USA, often severely reducing yields’ (Fischer <i>et al</i> 2000). Assume greater than 20% reduction	H	H
Impact quality?	Not documented to impact upon quality of yield.	L	MH
Affect land value?	Not documented to affect land value.	L	MH
Change land use?	Unlikely that the weed would cause a change in priority of land use.	L	MH
Increase harvest costs?	Possible that there will be a minor increase in time and labour required in harvesting.	M	MH
Disease host/vector?	‘Resistance to diseases’ (Undersander <i>et al</i> 1990). Not a known host or vector for diseases.	L	H

Impact Assessment Record

Scientific Name: Bassia scoparia

Common name: Kochia scoparia

References cited:

- All Allergy 1998, *Substance info: firebush / kochia (weed)*, Allergy Net, AllAllergy, viewed 29 Nov 2005, <http://allallergy.net/fapaidfind.cfm?cdeoc=595>
- California Invasive Plant Council 2003, *Plant assessment form: Kochia scoparia*, California Exotic Pest Plant Council and Southwest Vegetation Management Association, viewed 29 Nov 2005, http://www.cal-ipc.org/file_library/20382.pdf
- CRC for Australian Weed Management 2003, *Weed management guide: Kochia (Bassia scoparia)*, CRC for Australian Weed Management and the Commonwealth Department of the Environment and Heritage, viewed 29 Nov 2005, <http://www.deh.gov.au/biodiversity/invasive/publications/pubs/b-scoparia.pdf>
- Csurhes, S. & Edwards, R. 1998, *Chenopodiaceae: Kochia scoparia*, Potential Environmental weeds in Australia, Queensland Department of Natural Resources, viewed 29 Nov 2005, <http://www.deh.gov.au/biodiversity/invasive/publications/weeds-potential/results-kochia.html>
- Fischer, A.J., Messersmith, C.G., Nalewaja, J.D. & Duysen, M.E. 2000, 'Interference between spring cereals and Kochia scoparia related to environment and Photosynthetic pathways', *Agronomy Journal*, vol. 92, pp. 173-181, accessed Science Direct Database.
- Noxious Weed Control Board 1999, *Kochia (Kochia scoparia L.)*, Washington State, viewed 29 Nov 2005, http://www.nwcb.wa.gov/weed_info/Written_findings/Kochia_scoparia.html
- Undersander, D.J., Durgan, B.R., Kaminski, A.R., Doll, J.D., Worf, G.L. & Schulte, E.E. 1990, 'Kochia', in *Alternative Field Crops Manual*, University of Wisconsin and University of Minnesota, viewed Nov 29 2005, <http://www.hort.purdue.edu/newcrop/afcm/kochia.html>

Revisions

Date	Revised by	Revision

Invasiveness Assessment Record

Scientific name: *Cabomba caroliniana*

Common Name: cabomba

QUESTION	COMMENTS	RATING	CONFIDENCE
Establishment			
1. Germination requirements?	Requires direct sunlight to grow' (ISSG 2005). 'Factors believed to be important in affecting germination are red light, temperature and high carbon dioxide levels (Sanders 1976 cited in Mackey & Swarbrick 1998). Score as medium as insufficient evidence to determine specific germination requirements.	M	M
2. Establishment requirements?	'Grows well in eutrophic conditions with low pH but conditions above pH8 tend to defoliate the stems' (ISSG 2005). Requires direct sunlight to grow. Requires more specific conditions to establish.	ML	MH
3. How much disturbance is required?	'.. grows in the mud of stagnant to slow flowing water, including streams, and smaller rivers, and also ponds, lakes, reservoirs, sloughs, ditches, and canals' (ISSG 2005). Can establish in relatively intact natural ecosystems.	MH	MH
Growth/Competitive			
4. Life form?	Fully submerged aquatic plant (ISSG 2005).	H	MH
5. Allelopathic properties?	'Extracts of cabomba have allelopathic effects at medium and high concentrations' (Mackey & Swarbrick 1998). Allelopathic properties seriously affecting some plants.	MH	MH
6. Tolerates herb pressure?	'In its native habitat, <i>C. caroliniana</i> is eaten by waterfowl and some fish' (ISSG 2005). Consumed but capable of reproduction.	MH	MH
7. Normal growth rate?	Is a 'fast-growing' plant. Stated to be extremely competitive but can be outcompeted by such weeds as <i>Egeria densa</i> (Mackey & Swarbrick 1998). Moderately rapid growth that will equal competitive species of same life form.	MH	MH
8. Stress tolerance to frost, drought, w/logg, sal. etc?	'Can survive temperatures of less than 0 degrees (ISSG 2005). Stated to be a threat to freshwater plants and habitats only (Mackey & Swarbrick 1998). Aquatic plant – not drought tolerant. Tolerant to at least 2 and susceptible to at least 2.	ML	MH
Reproduction			
9. Reproductive system	Grows and sprouts mainly from fragmentation. Can reproduce by seed but seeds have not been recorded from Australian plants (Mackey & Swarbrick 1998).	H	MH
10. Number of propagules produced?	Seeds have not been recorded from Australian plants (Mackey & Swarbrick 1998). Mainly vegetatively reproduces. Score medium.	M	MH
11. Propagule longevity?	'In Louisiana seed is produced but viability is low and only about 25% of seeds germinate naturally'. Seeds can remain viable for more than two years (Mackey & Swarbrick 1998).	L	MH
12. Reproductive period?	'Can form dense stands' (ISSG 2005).	H	MH
13. Time to reproductive maturity?	Reaches maturity and produces viable propagules in under one year (Mackey and Swarbrick 1998).	H	MH

Invasiveness Assessment Record

Scientific name: *Cabomba caroliniana*

Common Name: cabomba

QUESTION	COMMENTS	RATING	CONFIDENCE
Dispersal			
14. Number of mechanisms?	Ørgaard (1991 cited in Mackey & Swarbrick 1998), suggested that like most water plants, seed dispersal is due to birds. Also spread through motorboats.	H	MH
15. How far do they disperse?	Ørgaard (1991 cited in Mackey & Swarbrick 1998), suggested that like most water plants, seed dispersal is due to birds. Also water dispersed. Very likely that some propagules will disperse greater than 1 km.	H	MH

References cited:

Invasive Species Specialist Group 2005, *Cabomba caroliniana* (*aquatic plant*), Global Invasive Species Database, The World Conservation Union, viewed 28 July 2005,
<http://www.issg.org/database/species/ecology.asp?si=402&fr=1&sts=sss>

Mackey, A.P. & Swarbrick, J.T. 1998, *Cabomba caroliniana* A. Gray In F.D. Panetta, R.H. Groves & R.C.H. Shepherd, eds, *The biology of Australian weeds*, vol.2, R.G. & F.J. Richardson, Melbourne.

Revisions

Date	Revised by	Revision

Present distribution of *Cabomba caroliniana* in Victoria

Scientific name: *Cabomba caroliniana* A. Gray

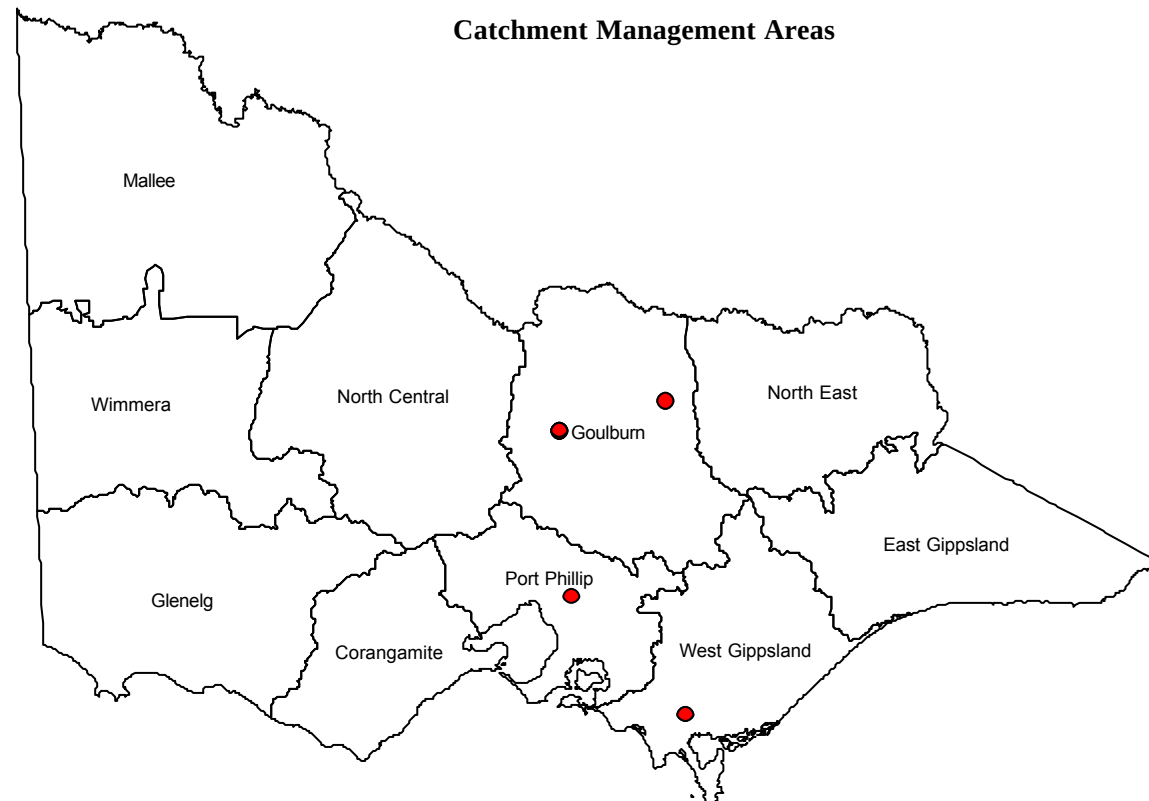
Common name(s): Cabomba, fanwort

Status:

Habitat:

Grows rooted in the mud of stagnant to slow flowing water, including streams and smaller rivers. Also grows in ponds, lakes, reservoirs, sloughs, ditches and canals. Can survive temperatures of less than 0 degrees but it prefers a warm, humid climate with a temperature range of 13 – 27 degrees C (ISSG 2005).

Present distribution with CMA boundaries



Potential distribution of *Cabomba caroliniana* in Victoria

Scientific name: *Cabomba caroliniana* A. Gray

Common name(s): Cabomba, fanwort

Status:

Habitat:

Grows rooted in the mud of stagnant to slow flowing water, including streams and smaller rivers. Also grows in ponds, lakes, reservoirs, sloughs, ditches and canals. Can survive temperatures of less than 0 degrees but it prefers a warm, humid climate with a temperature range of 13 – 27 degrees C (ISSG 2005).

Potential distribution produced from CLIMATE modelling refined by applying suitable landuse and vegetation type overlays with CMA boundaries

MAP OVERLAYS USED.

Land Use:

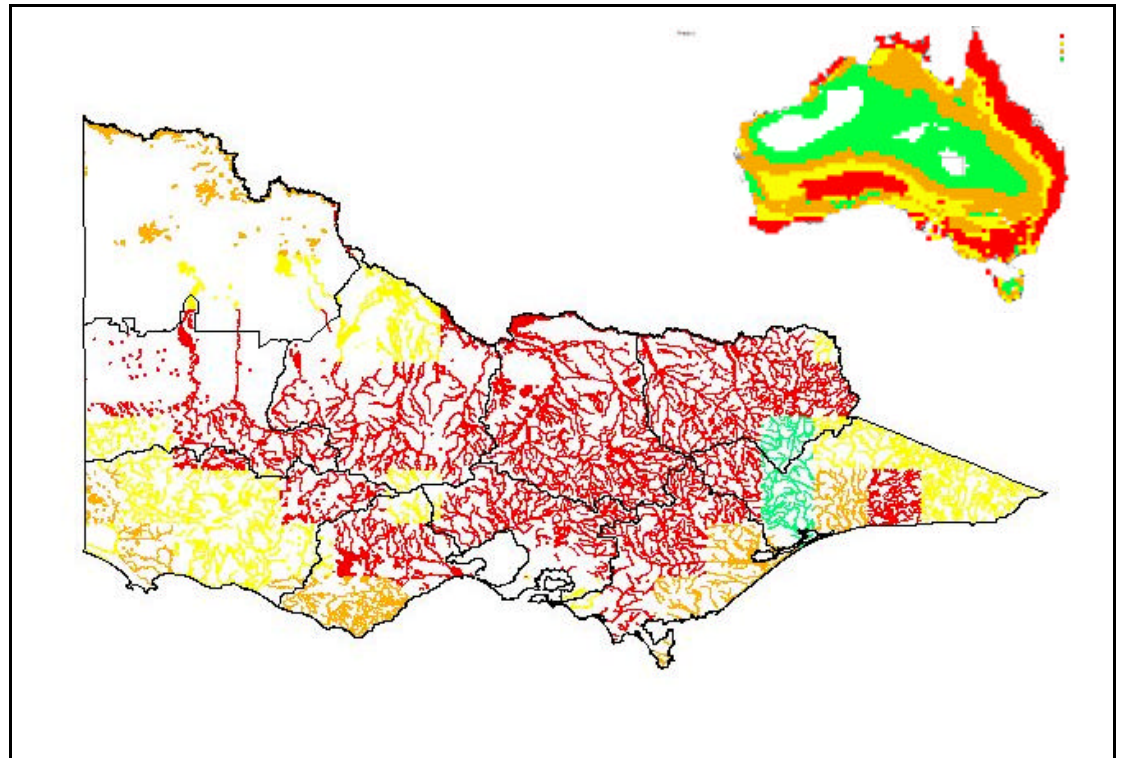
Broad vegetation types

Rainshadow woodland

Colours indicate possibility of *Cabomba caroliniana* infesting these areas.

 Red	= Very high	 Yellow	= High
 Orange	= Medium	 Green	= Likely

In the non-coloured areas the plant is unlikely to establish as the climate, soil or landuse is not presently suitable.



Impact Assessment Record

Scientific Name: *Cabomba caroliniana*

Common name: cabomba

QUESTION	COMMENTS	RATING	CONFIDENCE
Social			
1. Restrict human access?	Aquatic species (Panetta, <i>et al</i> 1998). Access to recreational areas not affected.	L	MH
2. Reduce tourism?	As a potentially invasive aquatic weed, water-based recreations may be seriously affected. "...water skiers or swimmers could easily become entangled by the weed's long thick stems and drown" (Panetta, <i>et al</i> 1998).	H	MH
3. Injurious to people?	No known toxic principles.	L	MH
4. Damage to cultural sites?	Moderate negative visual effect.	ML	MH
Abiotic			
5. Impact flow?	Cabomba could grow in irrigation channels, "...where it could impede water flow, cause overflows and blockages" (Panetta, <i>et al</i> 1998). Serious impact on flow.	H	MH
6. Impact water quality?	"Oxygen depletion can occur when massive dieback and consequent decomposition occurs. In Queensland, cabomba infestations may deleteriously affect water quality through increasing water colour" (Panetta, <i>et al</i> 1998). High effect on dissolved O ₂ levels.	H	MH
7. Increase soil erosion?	"Cabomba is found in ponds, ditches, small shallow lakes and slow flowing streams. If present in water storages, heavy infestations, because of the large volume of plant material, could cause water loss from overflow or seepage" (Panetta, <i>et al</i> 1998). Although water flow may not be significant, overflows may create some minor soil erosion,...	ML	MH
8. Reduce biomass?	"Cabomba is capable of rapid spread once it has been introduced in to a suitable water body. It was first reported from Lake MacDonald in April 1992, and by 1995 had invaded almost the whole of the lake's extensive littoral zone" (Panetta, <i>et al</i> 1998). As an aquatic species, the significant increase in biomass is a negative attribute.	H	MH
9. Change fire regime?	Aquatic species.	L	MH
Community Habitat			
10. Impact on composition (a) high value EVC	Basin=Snowy River- Brodnibb River (ISC=excellent); CMA=East Gippsland; CLIMATE=VH. "It is extremely persistent and can establish a monoculture by excluding native plant species" (ARMCANZ 2000). Monoculture within a specific layer.	H	MH
(b) medium value EVC	Aquatic species. All Victorian water bodies considered to comprise high value EVCs only (Weiss pers. coms.) ⁱ .	L	H
(c) low value EVC	Aquatic species. All Victorian water bodies considered to comprise high value EVCs only (Weiss pers. coms.) ⁱⁱ .	L	H
11. Impact on structure?	"It is extremely persistent and can establish a monoculture by excluding native plant species" (ARMCANZ 2000).	H	MH

Impact Assessment Record

Scientific Name: *Cabomba caroliniana*

Common name: cabomba

QUESTION	COMMENTS	RATING	CONFIDENCE
12. Effect on threatened flora?	This species is not documented as posing an additional risk to threatened flora.	MH	L
Fauna			
13. Effect on threatened fauna?	This species is not documented as posing an additional risk to threatened fauna.	MH	L
14. Effect on non-threatened fauna?	“Its ability to replace native aquatic plants, with the likely displacement of native fish and invertebrate populations, together with the ability to infest large areas of water, suggest that native aquatic life would be considerably endangered” (Panetta, <i>et al</i> 1998). Reduction in habitat leading to reduced populations.	MH	MH
15. Benefits fauna?	“In regions where it is invasive, it is not clear whether native fish and invertebrates utilize it readily as a habitat” (Panetta, <i>et al</i> 1998). Assume limited or no benefits.	H	MH
16. Injurious to fauna?	Not known to be injurious.	L	MH
Pest Animal			
17. Food source to pests?	Aquatic species (P & C 2001).	L	MH
18. Provides harbor?	Aquatic species (P & C 2001).	L	MH
Agriculture			
19. Impact yield?	No evidence. Not known as a weed of agriculture. It can occur in irrigation systems and demonstrate allelopathy on seed germination in wheat and lettuce (P & C 2001). Potential to affect irrigated crops. Impact unknown.	ML	MH
20. Impact quality?	Not weed of agriculture.	L	MH
21. Affect land value?	Not a weed of agriculture.	L	MH
22. Change land use?	Not a weed of agriculture.	L	MH
23. Increase harvest costs?	Not a weed of agriculture.	L	MH
24. Disease host/vector?	None evident.	L	MH

Impact Assessment Record

Scientific Name: *Cabomba caroliniana*

Common name: cabomba

References cited:

- ¹ Agriculture and Resource Management Council of Australia & New Zealand, Australian & New Zealand Environment & Conservation Council and Forestry Ministers, (2000) *Weeds of National Significance Cambomba (*Cabomba caroliniana*) Strategic Plan*. National Weeds Strategy Executive Committee, Launceston.
- Panetta, F.D., Groves R.H. & Shepherd, R.C.H. (eds) 1998, *The biology of Australian weeds: Volume 2*, R.G. & F. J. Richardson, Melbourne.
- Parsons, W.T. & Cuthbertson, E.G. 2001, *Noxious weeds of Australia*, 2nd ed., CSIRO Publishing, Collingwood.
- ¹ Weiss, J. Project Leader, Pest Plant Impact Assessment. DPI, Frankston. Tel 9785 0111. (11/07/03)

Revisions

Date	Revised by	Revision

ⁱ Weiss, J. Project Leader, Pest Plant Impact Assessment. DPI, Frankston. Tel 9785 0111. (11/07/03)

ⁱⁱ Weiss, J. Project Leader, Pest Plant Impact Assessment. DPI, Frankston. Tel 9785 0111. (11/07/03)

Invasiveness Assessment Record

Scientific name: *Calluna vulgaris*

Common Name: heather

QUESTION	COMMENTS	RATING	CONFIDENCE
Establishment			
1. Germination requirements?	‘Seeds can germinate all year round but most successful germination occurs during spring and autumn.’ ‘Rarely germinate without exposure to light, and germination increases when seeds are heat treated’ (CRC for Australian Weed Management 2000) . Requires natural seasonal temperatures for germination.	MH	M
2. Establishment requirements?	‘It does not tolerate shade’ (CRC for Australian Weed Management 2003). Requires access to light and open spaces to establish.	ML	M
3. How much disturbance is required?	‘Grows on poor undeveloped grassland .. prefers frost flats, scrub and higher tussock grasslands.’ Colonises up to altitudes of 1500m and is thus a serious threat to Australia’s alpine country’ (CRC for Australian Weed Management 2003). Can establish in healthy and undisturbed natural ecosystems.	H	M
Growth/Competitive			
4. Life form?	Evergreen perennial shrub (CRC for Australian Weed Management 2003). Life form– other	L	M
5. Allelopathic properties?	‘ releases allelopathic substances that may inhibit invasion and growth of some trees in heather-dominated heaths and moors’ (USDA Forest Service 2004).	MH	MH
6. Tolerates herb pressure?	‘Intense sheep grazing pressure .. will suppress new growth and flowering and may eventually eliminate <i>C. vulgaris</i> after a number of years. ... Light grazing will not be helpful’ (CRC for Australian Weed Management 2003). ‘Heather beetle <i>Lochmaea suturalis</i> .. was released in New Zealand in 1996 but has had limited success so far.’ ‘Heather production greatly exceeds heather consumption by herbivores’ (USDA Forest Service 2004).	MH	MH
7. Normal growth rate?	Seedlings are easily outcompeted by grasses (CRC for Australian Weed Management 2003). ‘ .. slow-growing, early successional shrub’ (USDA Forest Service 2004). Slow-growth, will be exceeded by many other species.	L	MH
8. Stress tolerance to frost, drought, w/logg, sal. etc?	‘Extremely frost hardy and tolerates water logging’ (CRC for Australian Weed Management 2003). ‘Fire helps spread the plant’ (Weber 2003). Grows on fixed sand dunes. ‘Very tolerant of salt spray’ (Underhill 1971). Highly resistant to at least 2 and not susceptible to more than one.	H	MH
Reproduction			
9. Reproductive system	Mainly reproduces by seed although vegetative reproduction occurs through layering. (CRC for Australian Weed Management 2003). Self-sterile but cross-pollinates (USDA Forest Service 2004).	H	MH
10. Number of propagules produced?	‘Each plant can produce several thousand flowers and tens of thousands of seeds’ (CRC for Australian Weed Management 2003). Above 2000	H	M
11. Propagule longevity?	‘.. seeds can remain viable for extended periods, up to 100 years’ (CRC for Australian Weed Management 2003).	H	M
12. Reproductive period?	‘Plants live for about 30 years’ (CRC for Australian Weed Management 2003). Produces viable propagules for 10 years or more.	H	M
13. Time to reproductive maturity?	‘In good conditions plants can produce seed within three years’ (CRC for Australian Weed Management 2003).	ML	M

Invasiveness Assessment Record

Scientific name: *Calluna vulgaris*

Common Name: heather

QUESTION	COMMENTS	RATING	CONFIDENCE
Dispersal			
14. Number of mechanisms?	' .. spread by wind, animals or walkers brushing against the plants' (CRC for Australian Weed Management 2003). Small wind-dispersed seeds.	H	M
15. How far do they disperse?	'It spreads at rates of up to seven kilometres a year along roads, through seeds being spread by road machinery ..' (Department of Conservation n.d.). Very likely that some propagules will disperse greater than 1km.	H	M

References cited:

CRC for Australian Weed Management 2003, *Weed management guide: Heather (Calluna vulgaris)*, CRC for Australian Weed Management and the Commonwealth Department of the Environment and Heritage, viewed 30 Nov 2005, http://www.weeds.crc.org.au/documents/wmg_heather.pdf

Department of Conservation, n.d., Adding a bit of colour, Department of Conservation, Te Papa Atawhai, New Zealand, viewed 30 Nov 2005, CRC for Australian Weed Management 2003, *Weed management guide: Heather (Calluna vulgaris)*, CRC for Australian Weed Management and the Commonwealth Department of the Environment and Heritage, viewed 30 Nov 2005, http://www.weeds.crc.org.au/documents/wmg_heather.pdf

US Department of Agriculture Forest Service 2004, *Species: Calluna vulgaris*, Forest Service, United States Department of Agriculture, viewed 30 Nov 2005, <http://www.fs.fed.us/database/feis/plants/shrub/calvul/all.html>

Underhill, T.L. 1971, *Heaths and heathers: Calluna, Daboecia and Erica*, David and Charles Limited, Devon.

Weber, E. 2003, *Invasive plant species of the world: a reference guide to environmental weeds*, CABI Publishing, Wallingford.

Revisions

Date Revised by Revision

Present distribution of *Calluna vulgaris* in Victoria

Scientific name: *Calluna vulgaris* (L.) Hull

Common name(s): heather

Status:

Habitat:

Grows on poor undeveloped grassland on acid soils, and prefers frost flats, scrub and higher tussock grasslands where the winters are cold (CRC for Australian Weed Management 2003).



Potential distribution of *Calluna vulgaris* in Victoria

Scientific name: *Calluna vulgaris* (L.) Hull

Common name(s): heather

Status:

Habitat:

Grows on poor undeveloped grassland on acid soils, and prefers frost flats, scrub and higher tussock grasslands where the winters are cold (CRC for Australian Weed Management 2003).

Potential distribution produced from CLIMATE modelling refined by applying suitable landuse and vegetation type overlays with CMA boundaries

MAP OVERLAYS USED.

Land Use:

Forest private plantation, forest public plantation, pasture dryland.

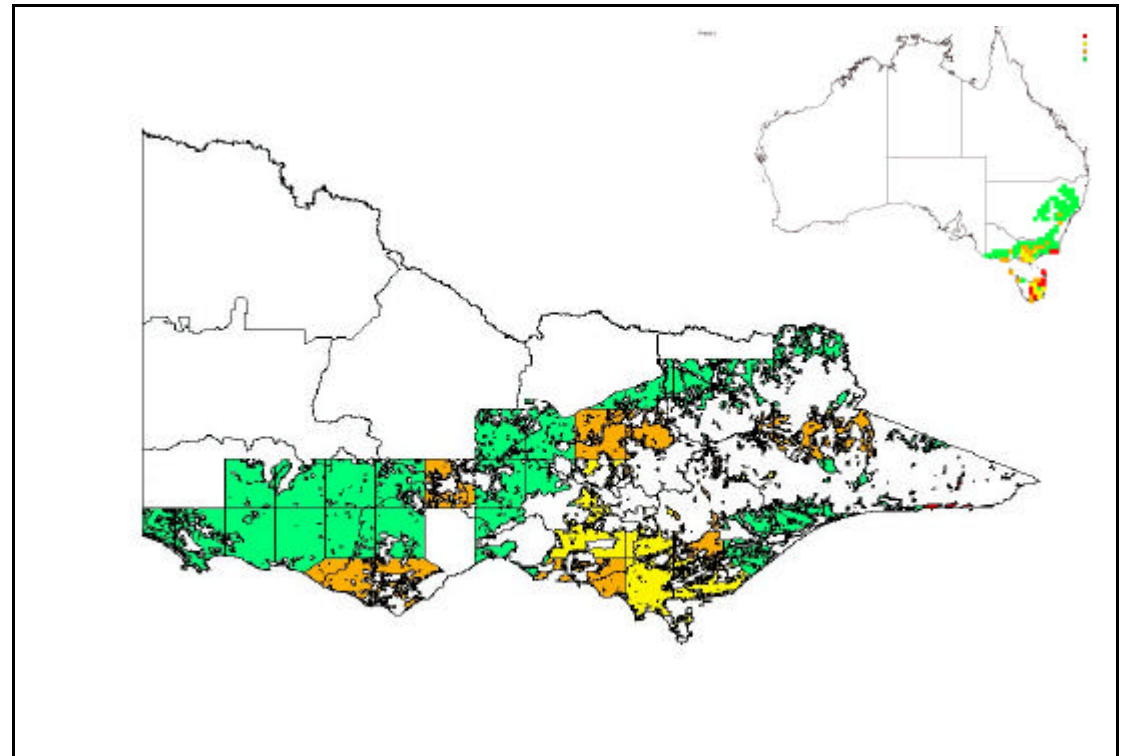
Broad vegetation types

Heathy woodland; heath; sedge-rich woodland; sub-alpine woodland; herb-rich woodland; sub-alpine grassy woodland; montane grassy woodland

Colours indicate possibility of *Calluna vulgaris* infesting these areas.

■ Red	= Very high	■ Yellow	= High
■ Orange	= Medium	■ Green	= Likely

In the non-coloured areas the plant is unlikely to establish as the climate, soil or landuse is not presently suitable.



Impact Assessment Record

Scientific Name: Calluna vulgaris

Common name: heather

QUESTION	COMMENTS	RATING	CONFIDENCE
Social			
1. Restrict human access?	Grows up to 1.25m, with woody pliable stems (CRC for Australian Weed Management 2003). 'Varies from low and sparse to dense and bushy' (USDA Forest Service 2004). Weed would have a minimal or negligible impact on human access.	L	MH
2. Reduce tourism?	'The role of heather as a highly valued and major floristic component of British and European heathlands' (Chapman & Bannister 1994). Visitors would be aware but not bothered by weed.	ML	H
3. Injurious to people?	Not known to have any injurious effects.	L	MH
4. Damage to cultural sites?	'.. alpine and subalpine areas of Victoria are threatened by <i>C. vulgaris</i> . Because of the cultural, environmental and recreational importance of these unique habitats..' (CRC for Australian Weed Management 2003). If the weed did occur in cultural sites, likely to have a moderate visual effect.	ML	M
Abiotic			
5. Impact flow?	Terrestrial species.	L	H
6. Impact water quality?	Terrestrial species	L	H
7. Increase soil erosion?	'.. deliberately planted in gardens and for erosion control' (CRC for Australian Weed Management 2003). Fibrous lateral root system. 'A surface mat is formed by adventitious roots and fine branches of the main root system' (USDA Forest Service 2004). Low probability of causing large scale soil movement.	L	MH
8. Reduce biomass?	In a national park in New Zealand ' <i>C. vulgaris</i> now dominates virtually all of the area previously covered in .. tussock grass-land' (Rogers & Leathwick 1996). Has a 'dense canopy during much of its life' (CRC for Australian Weed Management 2003). Likely that the biomass may increase.	L	H
9. Change fire regime?	'Dense canopy during much of its life and forms persistent leaf litter'. ' .. large accumulation of wood and litter' (CRC for Australian Weed Management 2003). 'Temperatures and [fire] intensities increased with stand age until the mature phase,' at which point they decline in degenerate stands (USDA Forest Service 2004). Likely that the weed would contribute to a minor change in intensity of fire risk.	ML	MH
Community Habitat			
10. Impact on composition (a) high value EVC	EVC= Clay heath (V); CMA=East Gippsland; Bioreg=East Gippsland Lowland; CLIMATE potential=VH. ' .. ability to dominate leads to a severe loss of biodiversity by displacing native vegetation and reducing the range and habitat available to native fauna' (Rogers & Leathwick 1996). In a national park in New Zealand ' <i>C. vulgaris</i> now dominates virtually all of the area previously covered in .. tussock grass-land' (CRC for Australian Weed Management 2003). Major displacement of some dominant species within a strata.	MH	MH
(b) medium value EVC	EVC= Heathy woodland (D); CMA=East Gippsland; Bioreg=East Gippsland Lowland; CLIMATE potential=VH. ' .. ability to dominate leads to a severe loss of biodiversity by displacing native vegetation and reducing the range and habitat available to native fauna' (Rogers & Leathwick 1996). In a national park in New Zealand ' <i>C. vulgaris</i> now dominates virtually all of the area previously covered in .. tussock grass-land' (CRC for Australian Weed Management 2003). Major displacement of some dominant species within a strata.	MH	MH

Impact Assessment Record

Scientific Name: Calluna vulgaris

Common name: heather

QUESTION	COMMENTS	RATING	CONFIDENCE
(c) low value EVC	EVC= Banksia woodland. (LC); CMA=East Gippsland; Bioreg=East Gippsland Lowland; CLIMATE potential=VH. ‘ .. ability to dominate leads to a severe loss of biodiversity by displacing native vegetation and reducing the range and habitat available to native fauna’ (Rogers & Leathwick 1996). In a national park in New Zealand ‘ <i>C. vulgaris</i> now dominates virtually all of the area previously covered in .. tussock grass-land’ (CRC for Australian Weed Management 2003). Major displacement of some dominant species within a strata.	MH	MH
11. Impact on structure?	‘ .. ability to dominate leads to a severe loss of biodiversity by displacing native vegetation and reducing the range and habitat available to native fauna’ (Rogers & Leathwick 1996). In a national park in New Zealand ‘ <i>C. vulgaris</i> now dominates virtually all of the area previously covered in .. tussock grass-land’ (CRC for Australian Weed Management 2003). Major effect on less than 60% of the floral strata.	MH	H
12. Effect on threatened flora?	This species is not documented as posing an additional risk to threatened flora.	MH	MH
Fauna			
13. Effect on threatened fauna?	This species is not documented as posing an additional risk to threatened fauna.	MH	MH
14. Effect on non-threatened fauna?	‘ .. ability to dominate .. displacing native vegetation and reducing the habitat available to native fauna’ (CRC for Australian Weed Management 2003). Has the potential to have a minor effect on non-threatened fauna spp.	ML	M
15. Benefits fauna?	‘ the most important yearlong food of rock ptarmigan and grouse in Scotland and Denmark’. ‘Large portion of the diet of domestic sheep’ ‘ primary cover of the European red grouse .. probably also provides good cover for other upland game birds, small nongame birds, and small mammals’ (USDA Forest Service 2004). Possible that the weed could provide some assistance in either food or shelter to desirable species.	MH	MH
16. Injurious to fauna?	Not known to be toxic to indigenous fauna.	L	MH
Pest Animal			
17. Food source to pests?	‘Red deer and mountain hare also browse heather’ (USDA Forest Service 2004). Possible that the weed would supply food for one or more minor pest spp.	ML	MH
18. Provides harbor?	‘ primary cover of the European red grouse .. probably also provides good cover for other upland game birds, small nongame birds, and small mammals’ (USDA Forest Service 2004). May provide harbour for minor pest spp.	ML	MH
Agriculture			
19. Impact yield?	Not a weed of agriculture.	L	MH
20. Impact quality?	Not a weed of cropping.	L	MH
21. Affect land value?	Weed not known to affect value of land.	L	MH

Impact Assessment Record

Scientific Name: Calluna vulgaris

Common name: heather

QUESTION	COMMENTS	RATING	CONFIDENCE
22. Change land use?	Weed not known to cause a change in priority of land use.	L	MH
23. Increase harvest costs?	Not a weed of cropping.	L	MH
24. Disease host/vector?	Not known as a host or vector for disease of agriculture.	L	MH

References cited:

Chapman, H.M. and Bannister, P. 1994, 'Vegetative reproduction and performance of *Calluna vulgaris* in New Zealand, with particular reference to Tongariro National Park', *New Zealand Journal of Ecology*, vol. 18, no. 2, pp. 109-121, viewed 30 Nov 2005, http://www.nzes.org.nz/nzje/free_issues/NZJEcol18_2_109.pdf

CRC for Australian Weed Management 2003, *Weed management guide: Heather (Calluna vulgaris)*, CRC for Australian Weed Management and the Commonwealth Department of the Environment and Heritage, viewed 30 Nov 2005, http://www.weeds.crc.org.au/documents/wmg_heather.pdf

Rogers, G.M. & Leathwick, J.R. 1996, 'North Island seral tussock grasslands. 3. The influence of heather (*Calluna vulgaris*) on rates of change from tussock grassland to shrubland', *New Zealand Journal of Botany*, vol. 34, pp. 473-487, viewed 30 Nov 2005, <http://www.rsnz.org/publish/nzjb/1996/161.php>

US Department of Agriculture Forest Service 2004, *Species: Calluna vulgaris*, Forest Service, United States Department of Agriculture, viewed 30 Nov 2005, <http://www.fs.fed.us/database/feis/plants/shrub/calvul/all.html>

Revisions

Date Revised by Revision

Invasiveness Assessment Record

Scientific name: *Calystegia silvatica*

Common Name: greater bindweed

QUESTION	COMMENTS	RATING	CONFIDENCE
Establishment			
1. Germination requirements?	Insufficient information to determine germination requirements for this plant. Score medium.	M	MH
2. Establishment requirements?	Found on waste ground, on roadsides (Brummitt 2002). ‘Weed of waste places and forest margins’ (TWS 2002). ‘Hedgerows, gardens, ungrazed pastures and waste places (Roy et al 1998). Would suggest that plant requires more specific requirements to establish but insufficient information to determine establish requirements. Score medium.	M	H
3. How much disturbance is required?	Found on waste ground, on roadsides (Brummitt 2002). ‘Weed of waste places and forest margins (TWS 2002). ‘Hedgerows, gardens, ungrazed pastures and waste places (Roy et al 1998). Establishes in highly disturbed natural ecosystems.	ML	H
Growth/Competitive			
4. Life form?	Herb. ‘Robust, sprawling, climbing, hairless perennial’ (Roy et al 1998). Life form – climber.	ML	H
5. Allelopathic properties?	None described.	L	H
6. Tolerates herb pressure?	Insufficient information to determine tolerance to herbivory pressure. Score medium.	M	MH
7. Normal growth rate?	‘An aggressive climbing weed’ (TWS 2002). Insufficient information to determine growth rate of plant in comparison to species of the same life form. Score medium.	M	MH
8. Stress tolerance to frost, drought, w/logg, sal. etc?	Has been found in the Tamar area, Tasmania along a walking trail and margins of the River Tamar (TWS 2002). Would suggest that the plant is frost tolerant. Not enough information to determine other stress tolerances. Score medium.	M	MH
Reproduction			
9. Reproductive system	Rhizomatous. Seed dispersal is less significant than vegetative spread (Brummitt 2002). ‘All plants in this complex are self-sterile and single populations normally do not set seed at all’ (Brummitt 2002). Vegetative reproduction.	MH	H
10. Number of propagules produced?	‘Spread vigorously by rhizomes’ (Brummitt 2002). Insufficient documentation to determine number of propagules per flowering event. Score medium.	M	H
11. Propagule longevity?	Plant vegetatively reproduces (Brummitt 2002).	L	H
12. Reproductive period?	Perennial plant. ‘.. in great abundance on waste ground over a distance of perhaps 100m, swamping other vegetation and climbing to a height of 3m’ (Brummitt 2002). Possible that the plant forms self-sustaining dense monocultures where it occurs but not enough evidence to determine reproductive period. Score medium.	M	H
13. Time to reproductive maturity?	Not enough evidence to determine plant’s time to reach reproductive maturity. Score medium.	M	MH

Invasiveness Assessment Record

Scientific name: *Calystegia silvatica*

Common Name: greater bindweed

QUESTION	COMMENTS	RATING	CONFIDENCE
Dispersal			
14. Number of mechanisms?	'.. there is no obvious dispersal mechanism and the seeds tend to merely fall to earth beneath the parent plant' (Brummitt 2002). Propagules mainly spread by gravity.	L	H
15. How far do they disperse?	'.. there is no obvious dispersal mechanism and the seeds tend to merely fall to earth beneath the parent plant' (Brummitt 2002). Very unlikely to disperse greater than 200m, most will be less than 20m.	L	H

References cited:

Brummitt, R. K. 2002, '*Calystegia silvatica* (*Convolvulaceae*) in Western North America', *Madrono*, vol. 49, no. 2, pp. 130-131.

Roy, B., Popay, I., Champion, D., James, T., & Rahman, A. 1998, *Common weeds of New Zealand*, New Zealand Plant Protection Society, New Zealand.

Tasmanian Weeds Society Incorporated 2002, Great bindweed, *Tasweeds*, Ed 14, p. 12, viewed 08 Jan 2006, http://www.angelfire.com/nb/tasweeds/tasweeds_march_2002.pdf

Revisions

Date Revised by Revision

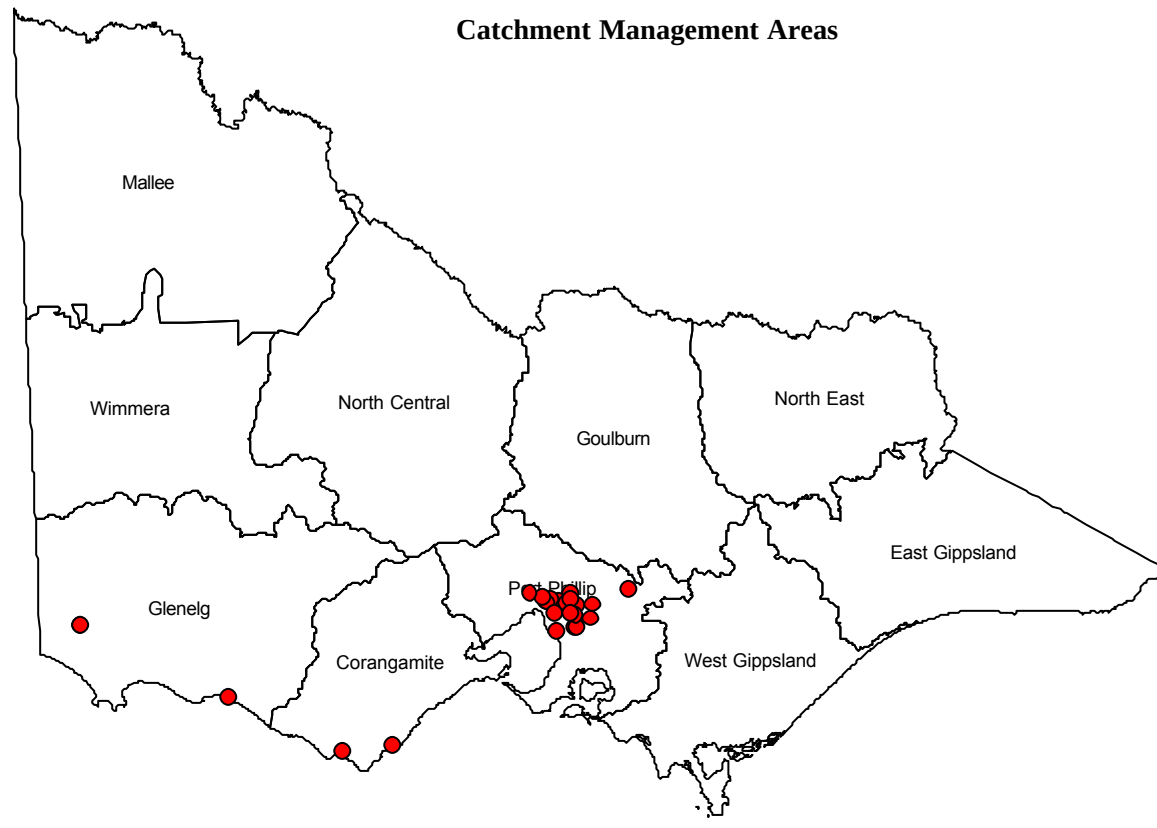
Present distribution of *Calystegia silvatica* in Victoria

Scientific name: *Calystegia silvatica* (Kit.) Griseb. Subsp. *fraterniflora* (Mack. & Bush) Brummitt

Common name(s): greater bindweed

Status:

Habitat: Found in hedgerows, gardens, ungrazed pastures and waste places (Roy *et al.* 1998). Weed of waste places and forest margins. Has been found in the Tamar area, Tasmania along a walking trail and margins of the River Tamar (Tasmanian Weed Society 2002).



Potential distribution of *Calystegia silvatica* in Victoria

Scientific name: *Calystegia silvatica* (Kit.) Griseb. Subsp. *fraterniflora* (Mack. & Bush) Brummitt

Common name(s): greater bindweed

Status:

Habitat: Found in hedgerows, gardens, ungrazed pastures and waste places (Roy *et al.* 1998). Weed of waste places and forest margins. Has been found in the Tamar area, Tasmania along a walking trail and margins of the River Tamar (Tasmanian Weed Society 2002).

Potential distribution produced from CLIMATE modelling refined by applying suitable landuse and vegetation type overlays with CMA boundaries

MAP OVERLAYS USED.

Land Use:

Horticulture
Pasture dryland

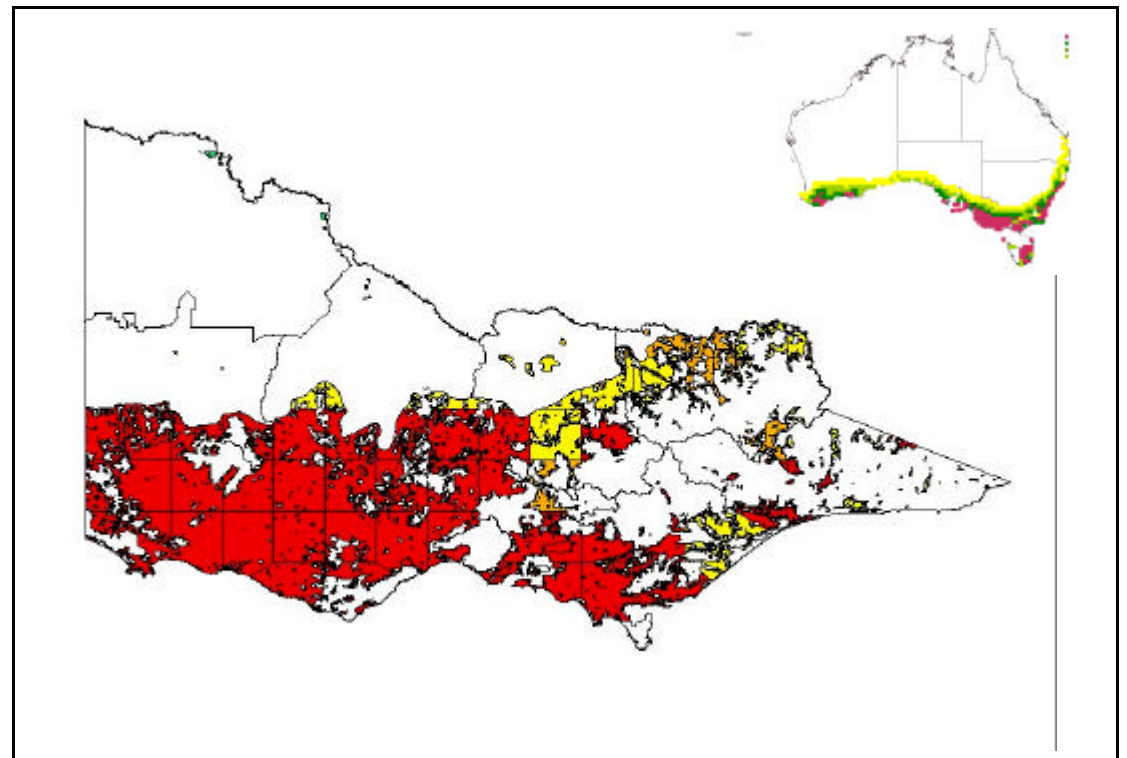
Broad vegetation types

Grassland

Colours indicate possibility of *Calystegia silvatica* infesting these areas.

Red	= Very high	Yellow	= High
Orange	= Medium	Green	= Likely

In the non-coloured areas the plant is unlikely to establish as the climate, soil or landuse is not presently suitable.



Impact Assessment Record

Scientific Name: *Calystegia silvatica*

Common name: greater bindweed

QUESTION	COMMENTS	RATING	CONFIDENCE
Social			
1. Restrict human access?	Weed is found in waste places, roadsides and forest margins (Brummitt 2002). A creeper growing to 3m or more. Because of the places it grows, and as it climbs over other plants, it would have a negligible impact upon access.	L	H
2. Reduce tourism?	‘Very conspicuous even to a passing motorist’ (Brummitt 2002). ‘Strongly climbing stems and the large white flowers were very conspicuous’ (Brummitt 2002). Minor effects to aesthetics.	ML	H
3. Injurious to people?	Plant not documented to cause injury or be toxic to humans.	L	H
4. Damage to cultural sites?	‘Very conspicuous even to a passing motorist’ (Brummitt 2002). ‘Strongly climbing stems and the large white flowers were very conspicuous’ (Brummitt 2002). If plant occurred at a cultural site it would have a moderate visual effect.	ML	H
Abiotic			
5. Impact flow?	Terrestrial species.	L	H
6. Impact water quality?	Terrestrial species.	L	H
7. Increase soil erosion?	‘.. shallow rhizomes spread for several metres under the soil surface, and root at the nodes’. ‘Aerial parts usually dying down in winter’ (Roy et al 1998) Occurs in already disturbed sites and would leave some soil exposed during winter but low probability of large-scale soil movement.	L	MH
8. Reduce biomass?	Found ‘in great abundance on waste ground over a distance of perhaps 100m, swamping other vegetation and climbing to a height of 3m’ (Brummitt 2002). Very vigorous habit and large glossy leaves. Likely to be an increase in biomass.	L	H
9. Change fire regime?	‘Aerial parts usually dying down in winter’ (Roy et al 1998). Climber with large glossy leaves occurring in waste places, roadsides and forest margins. Plant would have a small or negligible effect on fire risk.	L	MH
Community Habitat			
10. Impact on composition (a) high value EVC	EVC= Plains grassland (BCS =E); CMA=Port Phillip; Bioreg=Gippsland Plain; CLIMATE potential=VH. Found ‘in great abundance on waste ground over a distance of perhaps 100m, swamping other vegetation and climbing to a height of 3m’ (Brummitt 2002). Major displacement of some dominant species within a strata.	MH	H
(b) medium value EVC	EVC= Riverine grassy woodland (BCS =D); CMA=Mallee; Bioreg= Murray mallee; CLIMATE potential=L. Found ‘in great abundance on waste ground over a distance of perhaps 100m, swamping other vegetation and climbing to a height of 3m’ (Brummitt 2002). Minor displacement of some dominant species within a strata.	ML	H
(c) low value EVC	EVC= Coastal tussock grassland (BCS =LC); CMA=Port Phillip; Bioreg=Gippsland Plain; CLIMATE potential=VH. Found ‘in great abundance on waste ground over a distance of perhaps 100m, swamping other vegetation and climbing to a height of 3m’ (Brummitt 2002). Major displacement of some dominant	MH	H

Impact Assessment Record

Scientific Name: *Calystegia silvatica*

Common name: greater bindweed

QUESTION	COMMENTS	RATING	CONFIDENCE
	species within a strata.		
11. Impact on structure?	Found 'in great abundance on waste ground over a distance of perhaps 100m, swamping other vegetation and climbing to a height of 3m' (Brummitt 2002). Would have a major effect on the lower layers of the floral stratum.	MH	H
12. Effect on threatened flora?	This species is not documented as posing an additional risk to threatened flora.	MH	MH
Fauna			
13. Effect on threatened fauna?	This species is not documented as posing an additional risk to threatened fauna.	MH	MH
14. Effect on non-threatened fauna?	Weed not documented to have an effect on non-threatened fauna species.	L	MH
15. Benefits fauna?	Weed not known to facilitate the establishment of indigenous fauna.	H	MH
16. Injurious to fauna?	Weed not known to be toxic or have an effect on indigenous fauna.	L	MH
Pest Animal			
17. Food source to pests?	Weed not known to provide a food source to pest animals.	L	MH
18. Provides harbor?	Weed not known to provide harbour for pest species.	L	MH
Agriculture			
19. Impact yield?	In New Zealand, <i>Calystegia silvatica</i> grows in some asparagus crops 'as their growth habits are somewhat similar to asparagus and herbicides do not provide adequate long term control'. 'In asparagus.. weeds present during the growing season not only reduce the yield for the current season ...but restrict replenishment of carbohydrate reserves in the crop for the next season's growth' (Rahman & Sanders 1996). Minor impact on quantity of produce.	ML	H
20. Impact quality?	Weed not documented in Rahman and Sanders (1996) to impact upon quality.	L	H
21. Affect land value?	<i>Calystegia silvatica</i> is 'tolerant to most pre-emergent herbicides used in asparagus' (Rahman & Sanders 1996). However, no evidence to suggest that presence of this weed would effect land value.	L	H
22. Change land use?	No evidence to suggest that this weed would cause a change in priority of land use.	L	H

Impact Assessment Record

Scientific Name: *Calystegia silvatica*

Common name: greater bindweed

QUESTION	COMMENTS	RATING	CONFIDENCE
23. Increase harvest costs?	'Their sprawling climbing stems make harvesting of spears very difficult as they cover the rows and entwine the growing spears' (Rahman & Sanders 1996). Minor increase in cost of harvesting – more time and labour would be required.	M	H
24. Disease host/vector?	Weed not known to act as an alternative host or vector for disease of agriculture.	L	H

References cited:

Brummitt, R. K. 2002, '*Calystegia silvatica* (Convolvulaceae) in Western North America', *Madrono*, vol. 49, no. 2, pp. 130-131.

Rahman, A. & Sanders, P. 1996, "Succession of weed flora in some New Zealand asparagus crops", in *Proceedings of the eight International Asparagus Symposium*, Massey University, New Zealand, 21-26 November, pp. 279-284.

Roy, B., Popay, I., Champion, D., James, T., & Rahman, A. 1998, *Common weeds of New Zealand*, New Zealand Plant Protection Society, New Zealand.

Revisions

Date	Revised by	Revision

Invasiveness Assessment Record

Scientific name: *Carthamus glaucus*

Common Name: glaucous star thistle

QUESTION	COMMENTS	RATING	CONFIDENCE
Establishment			
1. Germination requirements?	Insufficient information to determine germination requirements for <i>C. glaucus</i> , although <i>C. lanatus</i> seeds germinate after autumn rains. Score medium.	M	L
2. Establishment requirements?	Can occur as a weed of agriculture (Solh & Pala 1990). Known to occur out in the open but not documented as to whether it can establish under a canopy. Insufficient evidence. Score medium.	M	L
3. How much disturbance is required?	Can occur as a weed of agriculture in chickpea (Solh & Pala 1990). Also known to grow with wild emmer wheat in Israel. Establishes in vigorously growing crops.	MH	H
Growth/Competitive			
4. Life form?	Annual herb (Walsh & Entwisle 1999). Life form – other.	L	H
5. Allelopathic properties?	None described. Little information on weed.	M	L
6. Tolerates herb pressure?	<i>Acanthiophilus helianthi</i> (a serious pest of safflower in Egypt) also uses <i>C. glaucus</i> as an alternative food-plant (Hegazi & Moursi 1983). Not enough documented evidence to determine tolerance to herbivory pressure.	M	L
7. Normal growth rate?	Not enough documented evidence to determine normal growth rate of weed.	M	L
8. Stress tolerance to frost, drought, w/logg, sal. etc?	Not enough documented evidence to determine stress tolerance of weed. Score medium.	M	L
Reproduction			
9. Reproductive system	Plant reproduces by seed. Not enough evidence to determine if reproduces by cross or self-pollination or both. Score as low.	L	M
10. Number of propagules produced?	Not enough documented evidence to determine number of propagules produced. Score medium.	M	L
11. Propagule longevity?	Not enough documented evidence to determine propagule longevity of plant. Score medium.	M	L
12. Reproductive period?	Annual herb (Walsh & Entwisle 1999). Mature plant produces viable propagules for only one year.	L	H
13. Time to reproductive maturity?	Annual herb (Walsh & Entwisle 1999). Reaches maturity and produces viable propagules in under a year.	H	H
Dispersal			
14. Number of mechanisms?	Seeds have a pappus (Walsh & Entwisle 1999). Would indicate that propagules may be wind dispersed but insufficient supporting documentary evidence. Score medium.	M	H

Invasiveness Assessment Record

Scientific name: *Carthamus glaucus*

Common Name: glaucous star thistle

QUESTION	COMMENTS	RATING	CONFIDENCE
15. How far do they disperse?	Not enough documented evidence to determine dispersal distance. Score medium.	M	L

References cited:

Hegazi, E. M. & Moursi, K.S. 1983, 'Studies on distribution and biology of the capsule fly *Acanthiophilus helianthi* Rossi on wild plants in Egyptian Western Desert', *Zeitschrift für Angewandte Entomologie*, vol. 96, no. 4, pp. 333-336, viewed 06 Dec 2005, CAB abstract database.

Solh, M.B. & Pala, M. 1990, 'Weed control in chickpea', *Options Mediterraneennes, Serie Seminaires*, Vol. 9, pp. 93-99, viewed 20 Jan 2006, CIHEAM database.

Walsh, N.G. & Entwistle, T.J. (eds) 1999, *Flora of Victoria: dicotyledons, cornaceae to asteraceae*, vol. 4, Inkata Press, Melbourne.

Revisions

Date	Revised by	Revision

Present distribution of *Carthamus glaucus* in Victoria

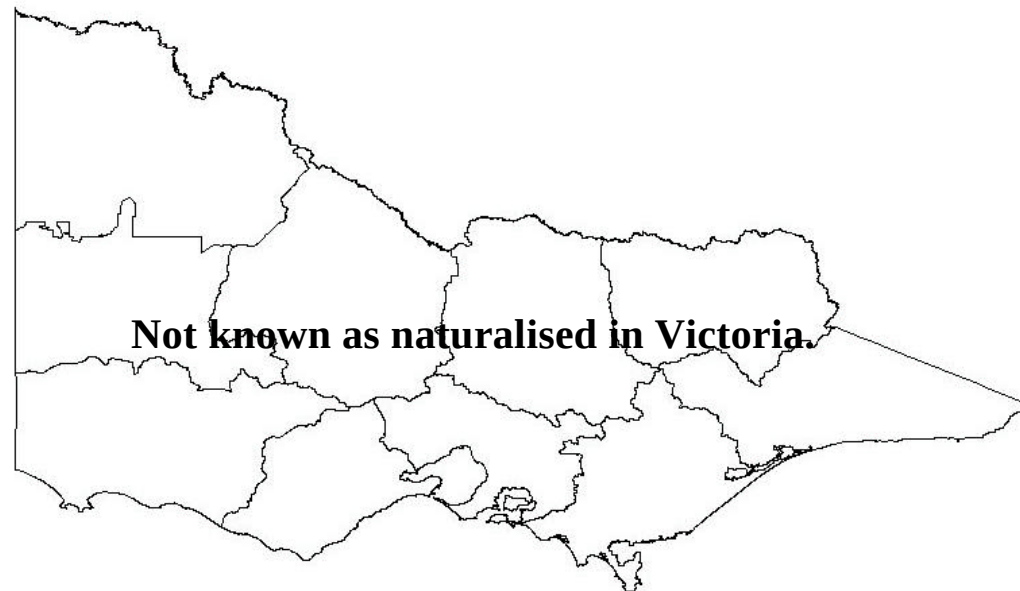
Scientific name: *Carthamus glaucus* M. Bieb.

Common name(s): glaucus star thistle

Status:

Habitat:

In Israel, found in terra rossa and basalt soils in areas with annual rainfall between 400 –600 mm. Elevations to 300m. Found in open sites and lower foothills (Youchan *et al* 2000). In West Asia and North Africa, found in chickpea crops (Solh & Pala 1990).



Potential distribution of *Carthamus glaucus* in Victoria

Scientific name: *Carthamus glaucus* M. Bieb.

Common name(s): glaucus star thistle

Status:

Habitat:

In Israel, found in terra rossa and basalt soils in areas with annual rainfall between 400 –600 mm. Elevations to 300m. Found in open sites and lower foothills (Youchan *et al* 2000). In West Asia and North Africa, found in chickpea crops (Solh & Pala 1990).

Potential distribution produced from CLIMATE modelling refined by applying suitable landuse and vegetation type overlays with CMA boundaries

MAP OVERLAYS USED.

Land Use:

Broadacre cropping
Pasture dryland

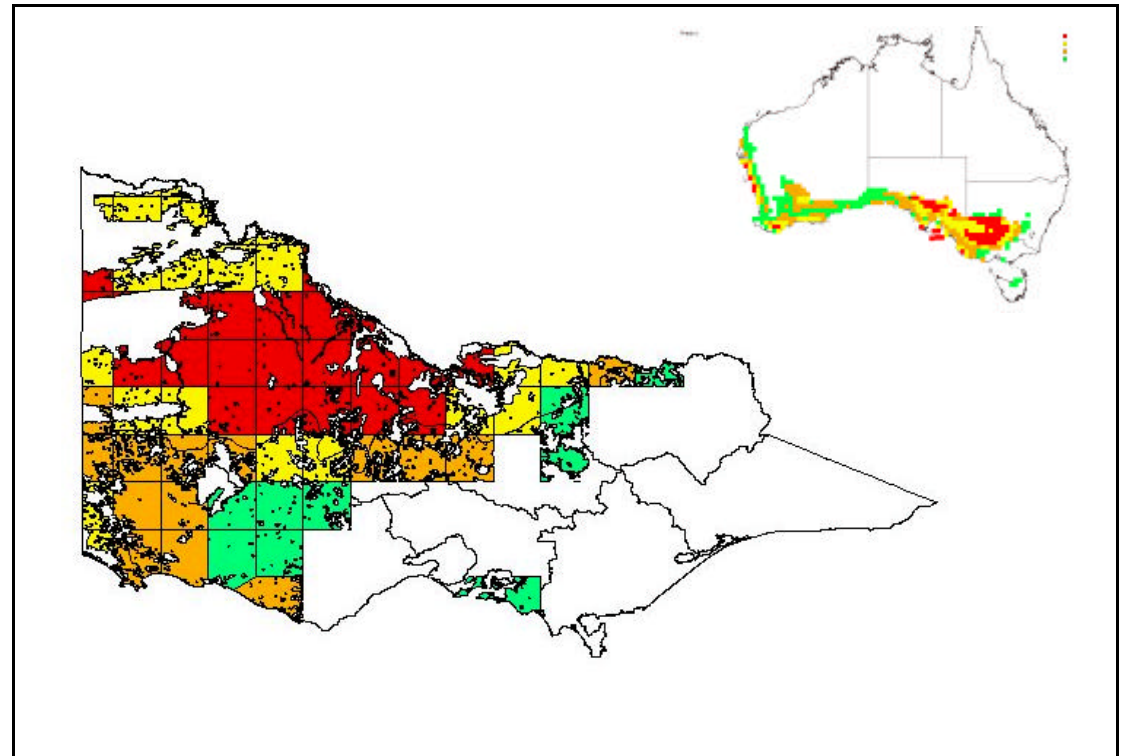
Broad vegetation types

Grassland

Colours indicate possibility of *Carthamus glaucus* infesting these areas.

 Red	= Very high	 Yellow	= High
 Orange	= Medium	 Green	= Likely

In the non-coloured areas the plant is unlikely to establish as the climate, soil or landuse is not presently suitable.



Impact Assessment Record

Scientific Name: *Carthamus glaucus*

Common name: glaucous star thistle

QUESTION	COMMENTS	RATING	CONFIDENCE
Social			
1. Restrict human access?	Grows up to 80cm high (Walsh & Entwisle 1999). Weed is spine-tipped thistle. Weed would have a low nuisance value.	ML	H
2. Reduce tourism?	Flowers in spring and summer (Walsh & Entwisle 1999). Has a purple flower and grows up to 80 cm high with spine-tipped leaves. Weed may have a minor effect on both aesthetics and recreational uses.	ML	H
3. Injurious to people?	Lobes of weed are spine-tipped (Walsh & Entwisle 1999). Likely that weed would cause minor damage from spines at certain times of the year.	ML	H
4. Damage to cultural sites?	Flowers in spring and summer (Walsh & Entwisle 1999). Has a purple flower and grows up to 80 cm high with spine-tipped leaves. Little or negligible effect on aesthetics.	L	H
Abiotic			
5. Impact flow?	Terrestrial species.	L	H
6. Impact water quality?	Terrestrial species.	L	H
7. Increase soil erosion?	Insufficient information to determine whether the weed would increase soil erosion. Score medium.	M	L
8. Reduce biomass?	Grows amongst crops (Solh & Pala 1990). In these situations there would be a direct replacement of biomass by invader.	ML	H
9. Change fire regime?	Insufficient information to determine whether weed would affect frequency or intensity of fire. Score medium.	M	L
Community Habitat			
10. Impact on composition (a) high value EVC	EVC= Chenopod grassland (BCS =E); CMA=Mallee; Bioreg=Murray mallee; CLIMATE potential=VH. Grows amongst crops (Solh & Pala 1990). Very little displacement of any indigenous species.	L	H
(b) medium value EVC	EVC= Riverine chenopod woodland(BCS =E); CMA=Wimmera; Bioreg=Murray mallee; CLIMATE potential=VH. Grows amongst crops (Solh & Pala 1990). Very little displacement of any indigenous species.	L	H
(c) low value EVC	EVC= Coastal tussock grassland (BCS =E); CMA=Port Phillip; Bioreg=Gippsland Plain; CLIMATE potential=L. Grows amongst crops (Solh & Pala 1990). Very little displacement of any indigenous species.	L	H
11. Impact on structure?	Grows amongst crops (Solh & Pala 1990). In these situations it would only effect one of the strata.	L	H
12. Effect on threatened flora?	This species is not documented as posing an additional risk to threatened flora.	MH	L

Impact Assessment Record

Scientific Name: *Carthamus glaucus*

Common name: glaucous star thistle

QUESTION	COMMENTS	RATING	CONFIDENCE
Fauna			
13. Effect on threatened fauna?	This species is not documented as posing an additional risk to threatened fauna.	MH	L
14. Effect on non-threatened fauna?	Not enough information to determine the effect the weed would have on non-threatened fauna species. Score as medium.	M	L
15. Benefits fauna?	Insufficient information to determine whether the weed provides benefits or facilitates the establishment of indigenous fauna. Score as medium.	M	L
16. Injurious to fauna?	Lobes of weed are spine-tipped (Walsh & Entwisle 1999). Insufficient documented evidence to determine the extent the weed affects indigenous fauna. Score as medium.	M	H
Pest Animal			
17. Food source to pests?	Insufficient documented evidence to determine the extent the weed provides a food source to assist in success of pest animals. Score as medium.	M	L
18. Provides harbor?	Insufficient evidence to determine the extent the weed provides harbour for serious pests. Score as medium.	M	L
Agriculture			
19. Impact yield?	‘The major weed species associated with chickpea in West Asia and North Africa include ... <i>Carthamus syriacus</i> In winter sown chickpea weeds present a serious threat to the crop and yield losses up to 98% have been reported’ (Solh & Pala 1990). Recorded as a common weed of Iran in Holm <i>et al</i> (1979). Has capacity to have a major impact on quantity of produce.	MH	H
20. Impact quality?	‘The contamination of produce with weed seeds reduces the crop quality’ (Solh & Pala 1990). Weed may have a minor impact on quality.	ML	H
21. Affect land value?	Not enough documented evidence to determine whether the weed affects land value. Score as medium.	M	L
22. Change land use?	Insufficient evidence to determine whether the weed would cause a change in priority of land use. Score as medium.	M	L
23. Increase harvest costs?	Insufficient evidence to determine the extent the presence of the weed increases the cost of harvest. Score as medium.	M	L
24. Disease host/vector?	Insufficient evidence to determine whether the weed acts as a host or vector for disease of agriculture. Score as medium.	M	L

Impact Assessment Record

Scientific Name: *Carthamus glaucus*

Common name: glaucous star thistle

References cited:

Holm, L., Pancho, J. V., Herberger, J.P. & Plucknett, D.L. 1979, *A geographical atlas of world weeds*, John Wiley & Sons, New York.

Solh, M.B. & Pala, M. 1990, 'Weed control in chickpea', *Options Mediterraneennes, Serie Seminaires*, Vol. 9, pp. 93-99, viewed 20 Jan 2006, CIHEAM database.

Walsh, N.G. & Entwistle, T.J. (eds) 1999, *Flora of Victoria: dicotyledons, cornaceae to asteraceae*, vol. 4, Inkata Press, Melbourne.

Revisions

Date	Revised by	Revision

Invasiveness Assessment Record

Scientific name: *Centaurea maculosa*

Common Name: spotted knapweed

QUESTION	COMMENTS	RATING	CONFIDENCE
Establishment			
1. Germination requirements?	'..germinate whenever moisture and temperature are suitable, and both fall and spring seedling emergence is common'(USDS 2004). Requires seasonal temperatures for germination.	MH	MH
2. Establishment requirements?	'Canopy cover had no effect on emergence rate, with spotted knapweed germinating equally well over a range from 0-100% canopy cover' (USFS 2004). Can establish without additional factors.	H	MH
3. How much disturbance is required?	'.. usually found in disturbed areas, once a plant colony is established, it may invade adjacent areas that are relatively undisturbed' Found on roadsides, foothill prairie habitats (CWMA n.d.). Most often found in disturbed ecosystems but has been found in relatively intact ecosystems also.	MH	M
Growth/Competitive			
4. Life form?	Perennial forb (USDS 2004) – other	L	H
5. Allelopathic properties?	' .. displaces native plant species by exuding the phytotoxin (-) –catechin from its roots. .. inhibition of native species' growth .. [causing] ultimately, death of root system' (Bais <i>et al</i> 2003).	MH	H
6. Tolerates herb pressure?	In US, gall flies' introduction has led to slight decrease in number of seeds that develop (Reebs 2002). 'Unlike other grazers, sheep love knapweed, and .. they do a pretty good job of controlling the infestation' (Alper 2004). Capable of flowering under moderate herbivory pressure.	MH	H
7. Normal growth rate?	' smooth brome is capable of suppressing the growth of spotted knapweed .. vigorous grass slow knapweed invasion' (USFS 2004). Maximum growth rate less than many species of same life-form.	ML	MH
8. Stress tolerance to frost, drought, w/logg, sal. etc?	In Washington, thrives in irrigated land... produces large quantities of seed that can survive fire' (USFS 2004). Drought tolerant, frost-tolerant. Not documented as to whether susceptible to salinity.	MH	MH
Reproduction			
9. Reproductive system	Reproduces almost entirely by seed. 'Requires cross-pollination between flowers on different plants' (USFS 2004).	L	MH
10. Number of propagules produced?	Depends on conditions and area but up to 25,260 seeds have been recorded on the one plant (USFS 2004).	H	MH
11. Propagule longevity?	'Thirty percent of seeds may be viable after eight years of burial' (TNC 2005).	ML	MH
12. Reproductive period?	'Form dense monocultures' (CWMA n.d). 'Often characterized by dense stands and virtually complete competitive exclusion of native species' (Callaway 1999). '..can live at least 9 years' (USFS 2004).	H	MH
13. Time to reproductive maturity?	'Fall and early spring germinating seedlings are capable of maturing into seed-producing adults in 1 yr' (Sheley <i>et al</i> 1998).	ML	H
Dispersal			
14. Number of mechanisms?	'Dispersal of achenes over long distances is facilitated by animals and birds...domestic sheep excrete viable seeds of spotted knapweed in their faeces for up to 7 days...can also be transported in rivers and other watercourses, and in crop seed and hay' (USFS 2004).	H	MH

Invasiveness Assessment Record

Scientific name: *Centaurea maculosa*

Common Name: spotted knapweed

QUESTION	COMMENTS	RATING	CONFIDENCE
15. How far do they disperse?	'Dispersal of achenes over long distances is facilitated by animals and birds...domestic sheep excrete viable seeds of spotted knapweed in their faeces for up to 7 days...can also be transported in rivers and other watercourses, and in crop seed and hay' (USFS 2004). Very likely that some propagules will disperse greater than 1 km.	H	MH

References cited:

Alper, J. 2004, 'Wicked weed of the west', *Smithsonian*, vol. 35, no. 9, pp. 33-35, viewed 02 Dec 2005, ProQuest database.

Bais, H.P., Vepachedu, R., Gilroy, S., Callaway, R.M. and Vivanco, J.M. 2003, 'Allelopathy and exotic plant invasion: from molecules and genes to species information', *Science*, vol. 301, no. 5638, pp. 1377, viewed 03 Dec 2005, ProQuest database.

Callaway, R.M., DeLuca, T.H. and Belliveau, W.M. 1999, 'Biological-control herbivores may increase competitive ability of the noxious weed *Centaurea maculosa*', *Ecology*, vol. 80, no. 4, pp. 1196-1201, viewed 02 Dec 2005, ProQuest database.

Colorado Weed Management Association n.d., *Spotted knapweed*, Colorado Natural areas program, Colorado Weed Management Association, viewed 02 Dec 2005, http://www.cwma.org/nx_plants/spot2.htm

Reebs, S. 2002, 'Double agent', *Natural History*, vol. 111, no. 4, p. 16, viewed 02 Dec 2005, ProQuest database.

Sheley, R.L., Jacobs, J.S. and Carpinelli, M.F. 1998, 'Distribution, biology, and management of diffuse knapweed (*Centaurea diffusa*) and spotted knapweed (*Centaurea maculosa*)', *Weed Technology*, vol. 12, pp. 353-362.

The Nature Conservancy 2005, *Element stewardship abstract for Centaurea maculosa*, The Global Invasive Species Initiative, The Nature Conservancy, viewed 02 Dec 2005, <http://tncweeds.ucdavis.edu/esadocs/documnts/centmac.html>

United States Forestry Service 2004, *Species information: Centaurea maculosa*, United States Department of Agriculture, Forestry Service, viewed 02 Dec 2005, <http://www.fs.fed.us/database/feis/plants/forb/cenmac/all.html>

Revisions

Date Revised by Revision

Present distribution of *Centaurea maculosa* in Victoria

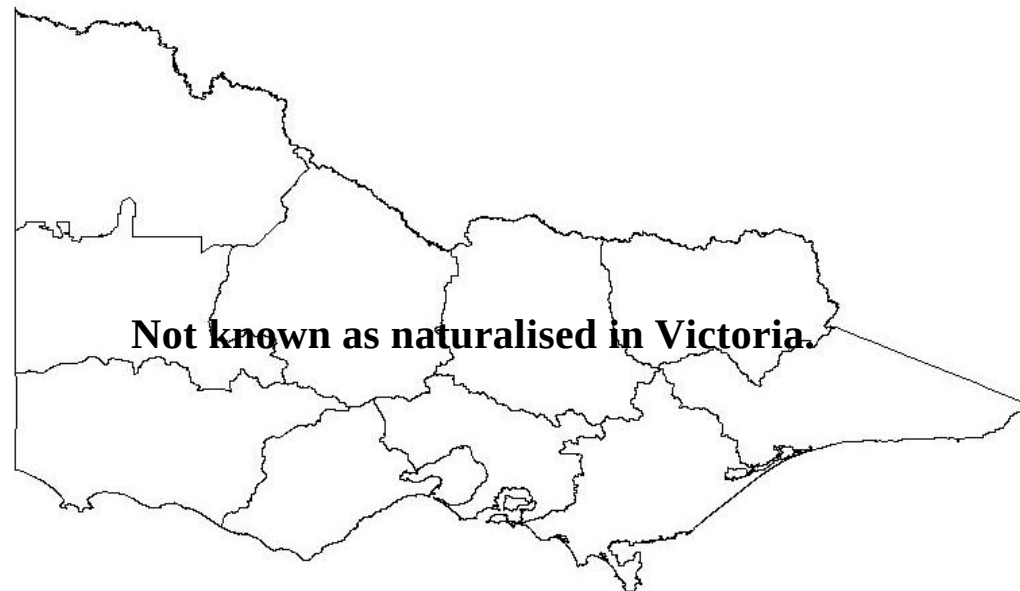
Scientific name: *Centaurea maculosa* Lam.

Common name(s): spotted knapweed

Status:

Habitat:

In the United States it occurs on well-drained, light-textured soils in areas of summer rainfall, in forest habitat as well as open grasslands and meadow. In central Washington it is often associated with irrigation where there is an abundance of moisture, deep soils and some degree of disturbance such as roadsides (Mauer *et al*, 1987).



Potential distribution of *Centaurea maculosa* in Victoria

Scientific name: *Centaurea maculosa* Lam.

Common name(s): spotted knapweed

Status:

Habitat:

In the United States it occurs on well-drained, light-textured soils in areas of summer rainfall, in forest habitat as well as open grasslands and meadow. In central Washington it is often associated with irrigation where there is an abundance of moisture, deep soils and some degree of disturbance such as roadsides (Mauer *et al*, 1987).

Potential distribution produced from CLIMATE modelling refined by applying suitable landuse and vegetation type overlays with CMA boundaries

MAP OVERLAYS USED.

Land Use:

Dryland and irrigated pasture

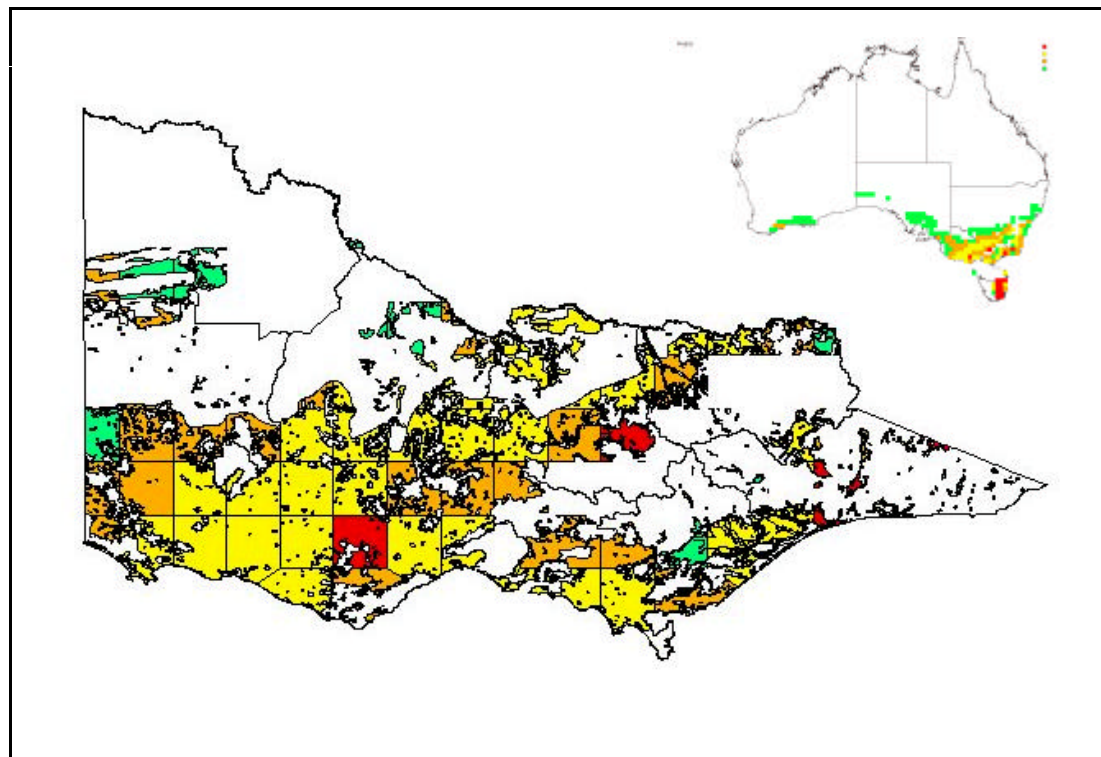
Broad vegetation types

Grassland, Plains grassy woodland, Valley grassy forest, Riverine grassy forest, Riparian forest, Mallee, Mallee woodland, Wimmera/Mallee woodland

Colours indicate possibility of *Centaurea maculosa* infesting these areas.

 Red	= Very high	 Yellow	= High
 Orange	= Medium	 Green	= Likely

In the non-coloured areas the plant is unlikely to establish as the climate, soil or landuse is not presently suitable.



Impact Assessment Record

Scientific Name: Centaurea maculosa

Common name: spotted knapweed

QUESTION	COMMENTS	RATING	CONFIDENCE
Social			
Restrict human access?	Weed grows up to 1.5 metres (USFS 2004). Forms monocultures but no evidence to suggest that human access would be restricted.	L	MH
Reduce tourism?	Weed has a purple flower and capable of forming monocultures (USFS 2004). Weed would have minor effect on aesthetics of site.	ML	MH
Injurious to people?	'The sap of spotted knapweed can cause skin irritation in some people' (CWMA n.d.).	ML	M
Damage to cultural sites?	No evidence to suggest weed has more than a negligible effect on aesthetics or structure of cultural sites.	L	MH
Abiotic			
Impact flow?	'Surface water runoff and stream sediment yield were 56 and 192% higher respectively for spotted knapweed-dominated sites compared to bunchgrass-dominated sites' (Sheley <i>et al</i> 1998). Minor impact on surface flow.	ML	H
Impact water quality?	'Surface water runoff and stream sediment yield were 56 and 192% higher respectively for spotted knapweed-dominated sites compared to bunchgrass-dominated sites' (Sheley <i>et al</i> 1998). Noticeable but minor effects.	ML	H
Increase soil erosion?	'.. contributes to increased surface run-off and soil erosion' (MacDonald <i>et al</i> 2003). 'Surface water runoff and stream sediment yield were 56 and 192% higher respectively for spotted knapweed-dominated sites compared to bunchgrass-dominated sites' (Sheley <i>et al</i> 1998). High probability of large scale soil movement with minor off-site implications.	MH	H
Reduce biomass?	Displaces other plants, especially grasses (MacDonald <i>et al</i> 2003). Likely that the biomass would increase.	L	H
Change fire regime?	'.. dense knapweed infestations can change the fire regime by changing the fuel characteristics and thus reducing the fire return interval at a given site' (USFS 2004). Minor change in the frequency of fire risk.	ML	MH
Community Habitat			
Impact on composition (a) high value EVC	EVC= Plains grassy woodland (E); CMA=Corangamite; Bioreg=Victorian Volcanic Plain; CLIMATE potential=VH. 'Reduces or displaces desirable plant species'(CWMA n.d.). Major displacement of some dominant species within a vegetation layer.	MH	M
(b) medium value EVC	EVC= Grassy dry forest (D); CMA=Goulburn Broken; Bioreg=Central Victorian Uplands; CLIMATE potential=VH. 'Reduces or displaces desirable plant species'(CWMA n.d.). Major displacement of some dominant species within a vegetation layer.	MH	M
(c) low value EVC	EVC= Heathy dry forest (LC); CMA=Corangamite; Bioreg=Victorian Volcanic Plain; CLIMATE potential=VH. Reduces or displaces desirable plant species'(CWMA n.d.). Major displacement of some dominant species within a vegetation layer.	MH	M
Impact on structure?	'Reduces or displaces desirable plant species'. Usually found in open, disturbed sites, replacing ground cover and capable of forming monospecific stands (CWMA n.d.). Likely to have a major effect on lower layer of the strata.	MH	M

Impact Assessment Record

Scientific Name: *Centaurea maculosa*

Common name: spotted knapweed

QUESTION	COMMENTS	RATING	CONFIDENCE
Effect on threatened flora?	No information available.	MH	L
Fauna			
Effect on threatened fauna?	No information available.	MH	L
Effect on non-threatened fauna?	'Large-scale infestations can impede access to more desirable forage for livestock and wildlife' (MacDonald et al 2003). 'Large reductions in available forage and wildlife use have been reported on knapweed-infested range' (USFS 2005). Likely to lead to a displacement of native animals, leading to reduction in number of animals.	MH	H
Benefits fauna?	Although both livestock and wildlife may eat it (USFS 2005), it provides very little support to desirable species.	H	MH
Injurious to fauna?	Not known to be injurious to fauna.	L	MH
Pest Animal			
Food source to pests?	No evidence that plant is food source to pest species (Alper 2004).	L	H
Provides harbor?	Not known to provide harbour for pests.	L	MH
Agriculture			
Impact yield?	Reduces the productivity of desirable forage plants. 'It invades pastureland and renders huge tracts commercially useless, because cattle, horses and most other animals turn up their noses at it' (USFS 2005). 'In Montana alone, it covers some 4.5 million acres and costs ranchers more than \$40 million annually in herbicide and lost productivity' (Alper 2004). Major impact on quantity.	MH	H
Impact quality?	No evidence to suggest the weed would impact upon quality.	L	MH
Affect land value?	In America it 'invades pastureland and renders huge tracts commercially useless, because cattle, horses and most other animals turn up their noses at it'. 'Tough for native plants to grow back when spotted knapweed has been eliminated' (Alper 2004). Potential to also invade pastureland in Australia.	M	H
Change land use?	In America 'it invades pastureland and renders huge tracts commercially useless, because cattle, horses and most other animals turn up their noses at it', although sheep may eat it. 'Tough for native plants to grow back when spotted knapweed has been eliminated' (Alper 2004). Potential to have same effect in Australia and lead to a major detrimental change and significant loss for agricultural usage.	MH	H
Increase harvest costs?	'In Montana alone, it covers some 4.5 million acres and costs ranchers more than \$40 million annually in herbicide and lost productivity' (Alper 2004). Increase in time and labour.	M	H
Disease host/vector?	Not a known host / vector of disease.	L	MH

Impact Assessment Record

Scientific Name: Centaurea maculosa

Common name: spotted knapweed

References cited:

Alper, J. 2004, 'Wicked weed of the west', *Smithsonian*, vol. 35, no. 9, pp. 33-35, viewed 02 Dec 2005, ProQuest database.

Colorado Weed Management Association n.d., *Spotted knapweed*, Colorado Natural areas program, Colorado Weed Management Association, viewed 02 Dec 2005, http://www.cwma.org/nx_plants/spot2.htm

MacDonald, N.W., Koetje, M.T. and Perry, B.J. 2003, 'Native warm-season grass establishment on spotted knapweed-infested gravel mine spoils', *Journal of Soil and Water Conservation*, vol. 58, no. 5, pp 243-251, viewed 02 Dec 2005, ProQuest Database.

Sheley, R.L., Jacobs, J.S. and Carpinelli, M.F. 1998, 'Distribution, biology, and management of diffuse knapweed (*Centaurea diffusa*) and spotted knapweed (*Centaurea maculosa*)', *Weed Technology*, vol. 12, pp. 353-362.

United States Forestry Service 2004, *Species information: Centaurea maculosa*, United States Department of Agriculture, Forestry Service, viewed 02 Dec 2005, <http://www.fs.fed.us/database/feis/plants/forb/cenmac/all.html>

Revisions

Date	Revised by	Revision

Invasiveness Assessment Record

Scientific name: *Chromolaena odorata*

Common Name: Siam weed

QUESTION	COMMENTS	RATING	CONFIDENCE
Establishment			
1. Germination requirements?	Germination begins at the start of rainy season (Parsons & Cuthbertson 2001).	MH	MH
2. Establishment requirements?	Thrives in open or partly shaded, well drained sites with annual rainfall greater than 1200mm. 'Can grow under dense rainforest canopies but less vigorously [than in open sun]' (Parsons & Cuthbertson 2001). Light promotes germination but does not become limiting factor (DNRM 2005). Requires natural seasonal disturbances.	MH	MH
3. How much disturbance is required?	'Thrives in disturbed areas such as pastures, plantations, clearings, roadsides and riverbanks, especially those in well-lit sites' (CRC for Weed Management 2003). Also occurs in forests and forest gaps, grass- and woodland (Weber 2003). Can occur in areas of minor disturbance.	MH	MH
Growth/Competitive			
4. Life form?	Herbaceous perennial (Weber 2003). Life form – other.	L	MH
5. Allelopathic properties?	Known to produce allelopathic compounds (Parsons & Cuthbertson 2001). '...the impoverished growth of the young teak and other timber plants in the nurseries and young plantations could be at least partly due to the allelopathic properties' (Ambika & Jayachandra 2001). As only 'partly due' extent not clear so scored as M.	M	MH
6. Tolerates herb pressure?	Toxic to stock. In Indonesia a leaf-feeding moth and gall fly showed some success in control. No biological control programs in Australia currently but being investigated. (CRC for Weed Management 2003). Not favoured and not under control program.	H	M
7. Normal growth rate?	Very competitive. 'Can outcompete and smother crops and native vegetation because of its phenomenal growth rate (20mm/day or 5 m per year) (DNRM 2005).	H	M
8. Stress tolerance to frost, drought, w/logg, sal. etc?	Tolerant to at least 2 (severe dry period and fire) but susceptible to at least 2 (doesn't grow well on waterlogged or saline soil) (Parsons & Cuthbertson 2001, CRC for Weed Management 2003).	ML	MH
Reproduction			
9. Reproductive system	Reproduces by seed (through both self and cross-pollination). Not known to vegetatively reproduce (Parsons & Cuthbertson 2001).	ML	MH
10. Number of propagules produced?	Prolific seed-producer. Up to 87,000 seeds per plant have been recorded in India (Parsons & Cuthbertson 2001).	H	MH
11. Propagule longevity?	Seed viability is at least eight years but research is on-going as suspected it could be longer (CRC for Weed Management 2003).	ML	M
12. Reproductive period?	Minimum life span of ten years, still producing viable propagules (CRC for Weed Management 2003). Reproductive period greater than 10 years.	H	M
13. Time to reproductive maturity?	Can reach maturity in less than 12 months (CRC for Weed Management 2003).	H	M

Invasiveness Assessment Record

Scientific name: *Chromolaena odorata*

Common Name: Siam weed

QUESTION	COMMENTS	RATING	CONFIDENCE
Dispersal			
14. Number of mechanisms?	Significant wind dispersal (fine pappus covering), human and equipment contamination (Parsons & Cuthbertson 2001). Also carried by water (DNRM 2005).	H	MH
15. How far do they disperse?	Spread 'large distances', and very likely that some propagules will disperse greater than 1 km as they easily adhere to clothing and equipment with their weightlessness aiding long-distant dispersal (CRC for Weed Management 2003).	H	M

References cited:

Ambika, S.R. & Jayachandra 2001, *The problem of Chromolaena weed, Chromolaena odorata*, Biocontrol in the tropics, Charles Darwin University, Darwin, viewed 11 Nov 2005, <http://www.ehs.cdu.edu.au/chromolaena/pubs/problem.html>

CRC for Weed Management 2003, *Weed management guide: Siam weed or chromolaena (Chromolaena odorata)*, CRC for Australian Weed Management, Commonwealth Department of Environment and Heritage, viewed 09 Nov 2005, http://www.weeds.crc.org.au/documents/wmg_siam_weed.pdf

Department of Natural Resources and Mines 2005, *Siam weed: Chromolaena odorata*, Department of Natural Resources and Mines, Queensland Government, Brisbane, viewed 09 Nov 2005, http://www.nrm.qld.gov.au/pests/weeds/declared_plants/siam_weed.html

Parsons, W.T. & Cuthbertson, E. G. 2001, *Noxious weeds of Australia*, 2nd edn, CSIRO Publishing, Collingwood.

Weber, E. 2003, *Invasive plant species of the world: a reference guide to environmental weeds*, CABI Publishing, Wallingford.

Revisions

Date	Revised by	Revision

Present distribution *Chromolaena odorata* of in Victoria

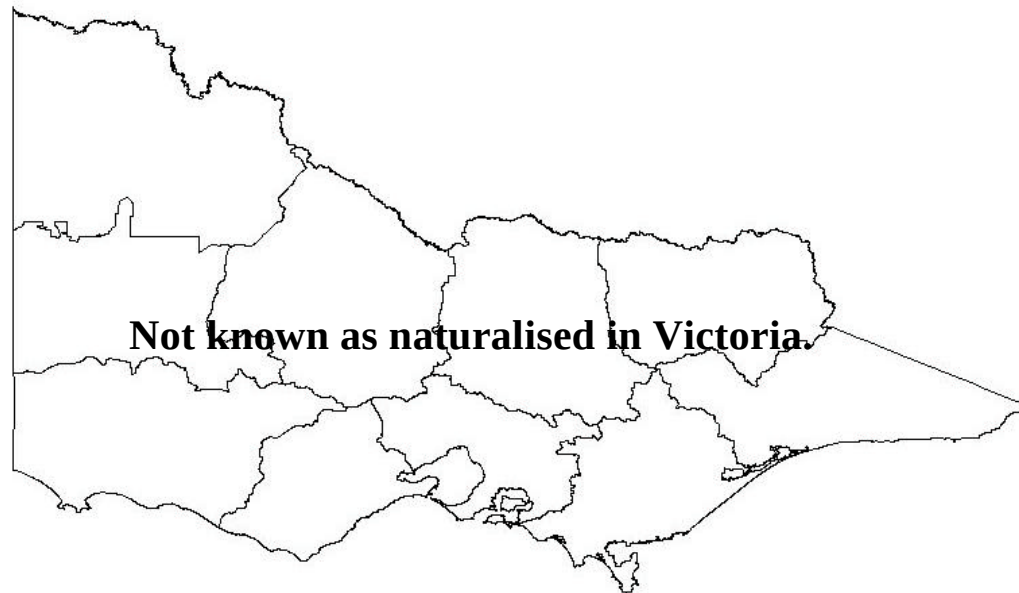
Scientific name: *Chromolaena odorata* (L.) R.M. King & H.

Common name(s): Siam weed

Status:

Habitat:

Can occur in most tropical and sub-tropical terrestrial habitats below 1000m altitude, except for undisturbed rainforest. Requires at least 1200 mm annual rainfall, but tolerates severe dry seasons. Grows in many soil types but prefers well-drained soils. (ISSG 2000) Native in grasslands, savannas and forest margins (Weber 2003).



Potential distribution *Chromolaena odorata* of in Victoria

Scientific name: *Chromolaena odorata* (L.) R.M. King & H.

Common name(s): Siam weed

Status:

Habitat:

Can occur in most tropical and sub-tropical terrestrial habitats below 1000m altitude, except for undisturbed rainforest. Requires at least 1200 mm annual rainfall, but tolerates severe dry seasons. Grows in many soil types but prefers well-drained soils. (ISSG 2000) Native in grasslands, savannas and forest margins (Weber 2003).

Potential distribution produced from CLIMATE modelling refined by applying suitable landuse and vegetation type overlays with CMA boundaries

MAP OVERLAYS USED.

Land Use:

Forest private / public plantation
Horticulture
Pasture dryland / irrigation

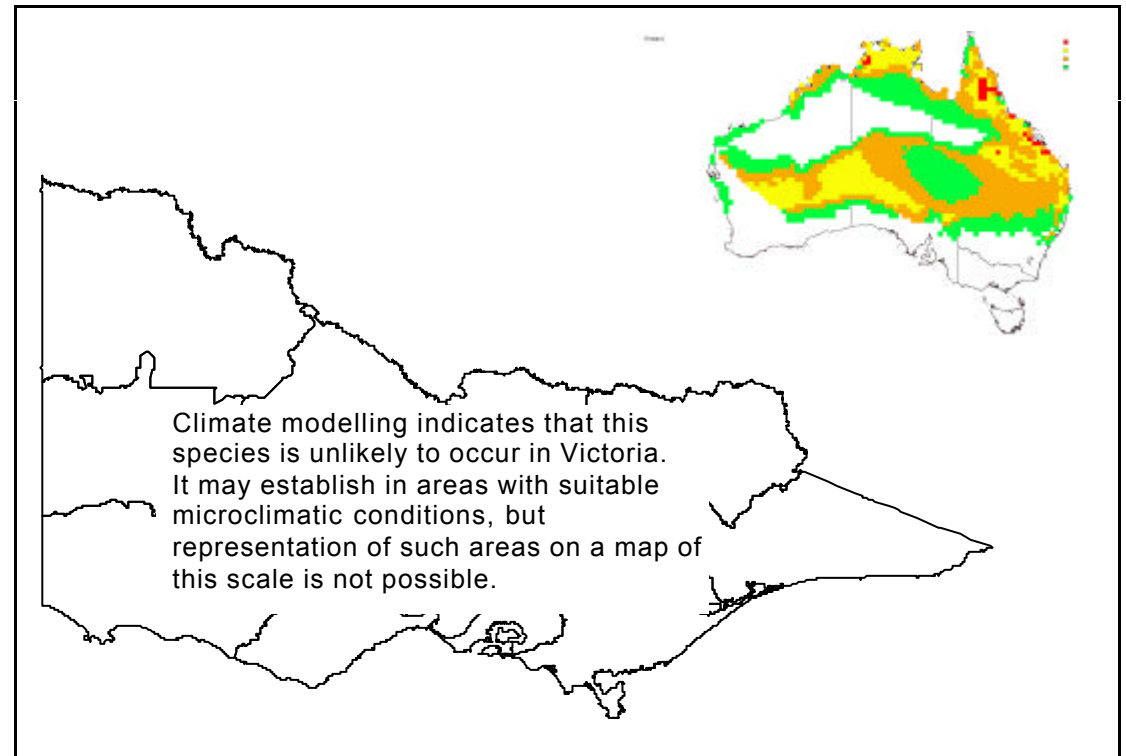
Broad vegetation types

Coastal scrubs and grassland; heathy woodland; lowland forest; heath; swamp scrub; moist foothill forest; grassland; plains grassy woodland; valley grassy forest; herb-rich woodland; riverine grassy woodland; riparian forest

Colours indicate possibility of *Chromolaena odorata* infesting these areas.

Red	= Very high	Yellow	= High
Orange	= Medium	Green	= Likely

In the non-coloured areas the plant is unlikely to establish as the climate, soil or landuse is not presently suitable.



Impact Assessment Record

Scientific Name: Chromolaena odorata

Common name: Siam weed

QUESTION	COMMENTS	RATING	CONFIDENCE
Social			
1. Restrict human access?	Forms dense impenetrable thickets between 1.5 to 5m high. Much-branched shrub (Parsons & Cuthbertson 2001). 'Engulfs native vegetation especially along river banks and on forest fringes' (Bilowol 2005). High nuisance value with access to areas difficult.	MH	MH
2. Reduce tourism?	Found in North Queensland and concern that the weed may interfere with tourism activities including white water rafting, bushwalking, camping and fishing (DNRM 2005b). Some recreational uses affected.	MH	M
3. Injurious to people?	'May cause skin complaints and asthma in allergy-prone people' (DNRM 2005a). 'Hand weeding of <i>Chromolaena</i> reportedly caused skin allergy in a number of plantation workers ... and the dry stumps left after weeding operation caused poisonous wounds in the feet of the workers' (Ambika & Jayachandra 2001).	MH	MH
4. Damage to cultural sites?	Weeds occur in the Wet Tropics which is considered part of a "living cultural landscape" by Rainforest Aboriginal peoples to whom it is has spiritual, social, economic and historic significance (Wet Tropics Management Authority 2002). Not likely to cause structural damage but may have moderate visual effect.	ML	M
Abiotic			
5. Impact flow?	Terrestrial species	L	MH
6. Impact water quality?	Terrestrial species	L	MH
7. Increase soil erosion?	Fibrous root system extending up to 30cm. Although the above-ground foliage dies off, the dense mass of leaf stems would provide soil cover (Parsons & Cuthbertson 2001). Unlikely that the weed would contribute to large-scale soil movement.	L	MH
8. Reduce biomass?	'Forms dense stands which prevent the establishment of other species' (ISSG 2000). Where the plant occurs on pastures, clearings, riverine or wetland areas, biomass would increase significantly.	L	MH
9. Change fire regime?	'Cause more frequent and intense bushfires as dry Siam weed stalks burn hotter and flames go higher into trees than a pure grass fire' (DNRM 2005a).	H	M
Community Habitat			
10. Impact on composition (a) high value EVC	The potential distribution of <i>Chromolaena odorata</i> excludes Victoria (Kriticos, Yonow & McFayden 2005). No impact on EVCs in Victoria.	L	H
(b) medium value EVC	The potential distribution of <i>Chromolaena odorata</i> excludes Victoria (Kriticos, Yonow & McFayden 2005). No impact on EVCs in Victoria.	L	H
(c) low value EVC	The potential distribution of <i>Chromolaena odorata</i> excludes Victoria (Kriticos, Yonow & McFayden 2005). No impact on EVCs in Victoria.	L	H
11. Impact on structure?	'In the establishment phase can choke out (plantation) crops as well as young forest trees' (Parsons & Cuthbertson 2001). 'Forms dense thickets that persist and prevent the establishment of all other species' (Weber 2003). The plant would have a major effect on all layers.	H	MH

Impact Assessment Record

Scientific Name: Chromolaena odorata

Common name: Siam weed

QUESTION	COMMENTS	RATING	CONFIDENCE
12. Effect on threatened flora?	No information available.	MH	L
Fauna			
13. Effect on threatened fauna?	The plant affects the Nile crocodile nesting areas by shading and cooling riverbanks skewing the sex balance toward females (Leslie 2001). Potential to do same in Australia but not relevant in Victoria as establishment of weed shown to be highly unlikely and fauna species not in Victoria.	L	MH
14. Effect on non-threatened fauna?	'Could completely replace pasture grasses, leaving native wildlife with nothing to eat' (Bilowol 2005). As the plant replaces all other species, has the potential to reduce habitat for fauna.	MH	MH
15. Benefits fauna?	No known benefits to fauna.	H	MH
16. Injurious to fauna?	Toxic to stock 'killing more than 3000 cattle annually in the Philippines. Also causes abortions' (Parsons & Cuthbertson 2001). Potential to affect non-threatened native fauna.	H	MH
Pest Animal			
17. Food source to pests?	Not a known source of food to pests.	L	MH
18. Provides harbor?	'In some countries dense thickets harbour wild pigs and rodents' (Parsons & Cuthbertson 2001). Has the potential to provide harbour for minor pest spp.	ML	MH
Agriculture			
19. Impact yield?	A major pest of crops in Asia and Africa and 'some agricultural areas in South-East Asia have been abandoned because Siam weed has taken over pasture and crops' (CRC for Weed Management 2003).	H	M
20. Impact quality?	'..carry a number of seed borne fungi, like <i>Fusarium culmorum</i> , <i>F. moniliforme</i> , <i>F. semiseptum</i> and <i>F. solani</i> have been reported as pathogens of food crops' (Ambika & Jayachandra 2001). Fusarian Head Blight (FHB) is caused by several species of Fusaria. "FHB infected grain may be downgraded at the market' (McMullen & Stack 1999). Has the potential to have a minor impact on quality of produce.	ML	MH
21. Affect land value?	'..it was estimated the weed would cost more than \$14.5 million annually to manage within the agriculture sector if allowed to take hold in Australia' (Bilowol 2005). No documented evidence to show that the weed affects land value but with the high costs associated with management in places where it has affected plantations it has the potential to decrease land value.	M	MH
22. Change land use?	A major pest of crops in Asia and Africa and 'some agricultural areas in South-East Asia have been abandoned because Siam weed has taken over pasture and crops' (CRC for Weed Management 2003). Risk that the presence of this weed could change land use.	H	M
23. Increase harvest costs?	No documented evidence but as the plant 'forms dense tangled thickets' (Ambika & Jayachandra 2001) it is assumed that there would be some increase in the cost of harvesting in both time and money. Potential for thickets to interfere with hand harvesting of crops.	M	MH
24. Disease host/vector?	'Alternative host for fungal diseases' (Parsons & Cuthbertson 2001).	M	MH

Impact Assessment Record

Scientific Name: Chromolaena odorata

Common name: Siam weed

References cited:

- Ambika, S.R. & Jayachandra 2001, *The problem of Chromolaena weed*, Chromolaena odorata, Biocontrol in the tropics, Charles Darwin University, Darwin, viewed 11 Nov 2005, <http://www.ehs.cdu.edu.au/chromolaena/pubs/problem.html>
- Bilowol, J 2005, Devastating plant threatens coast, *The Australian* [online] 10 November, viewed 11 Nov 2005, http://www.theaustralian.news.com.au/common/story_page/0,5744,15891895%255E30417,00.html
- CRC for Weed Management 2003, *Weed management guide: Siam weed or chromolaena (Chromolaena odorata)*, CRC for Australian Weed Management, Commonwealth Department of Environment and Heritage, viewed 09 Nov 2005, http://www.weeds.crc.org.au/documents/wmg_siam_weed.pdf
- Department of Natural Resources and Mines 2005a, *Siam weed: Chromolaena odorata*, Department of Natural Resources and Mines, Queensland Government, Brisbane, viewed 09 Nov 2005, http://www.nrm.qld.gov.au/pests/weeds/declared_plants/siam_weed.html
- Department of Natural Resources and Mines 2005b, Siam weed found in rafting area, media release, 12 July, Department of Natural Resources and Mines, Brisbane, viewed 11 Nov 2005, http://www.nrm.qld.gov.au/about/media/jul/12_siam_weed.html
- Invasive Species Specialist Group 2000, *Chromolaena odorata (herb)*, Global Invasive Species Database, Auckland, viewed 09 Nov 2005, <http://www.issg.org/database/species/ecology.asp?si=47&fr=1&sts=>
- Kriticos, D.J., Yonow, T. & McFayden, R.E. 2005, 'The potential distribution of *Chromolaena odorata* (Siam weed) in relation to climate', *Weed Research*, vol. 45, pp. 246-254.
- Leslie, J 2001, *Journal Watch: Invasive plants threaten Nile crocodile*, Conservation in Practice, vol. 2, no. 3, viewed 09b Nov 2005, <http://www.conbio.org/cip/article23inv.cfm>
- McMullen, M.P. & Stack, R.W. 1999, *Fusarium head blight (Scab) of small grains*, North Dakota State University Extension Service, NDSU, viewed: 14 Nov 2005, <http://www.ext.nodak.edu/extpubs/plantsci/smgrains/pp804w.htm>
- Parsons, W.T. & Cuthbertson, E. G. 2001, *Noxious weeds of Australia*, 2nd edn, CSIRO Publishing, Collingwood.
- Weber, E. 2003, *Invasive plant species of the world: a reference guide to environmental weeds*, CABI Publishing, Wallingford.
- Wet Tropics management Authority 2002, *Rainforest Aboriginal heritage*, World Heritage: Wet Tropics, Environment Protection Authority, Cairns, viewed 11 Nov 2005, http://www.wettropics.gov.au/rah/rah_default.html

Revisions

Date	Revised by	Revision

Invasiveness Assessment Record

Scientific name: *Cryptostegia grandiflora*

Common Name: rubber vine

QUESTION	COMMENTS	RATING	CONFIDENCE
Establishment			
1. Germination requirements?	Seeds need between 5 and 15 days exposure to moist, warm (20-30°C) conditions before they will germinate. Germination occurs following good rain (CRC for Australian Weed Management 2003).	MH	M
2. Establishment requirements?	Establishment is enhanced by the presence of mulch on the soil surface (Parsons & Cuthbertson 2001). Plants tolerate shade and grow in a wide range of temperatures but are well adapted to a monsoonal climate (DNRME 2004). Wet shaded areas that protect the seeds from drying out are ideal with seeds readily germinating on riverbanks and other moist areas (CRC for Australian Weed Management 2003). However, the plant can also establish in dry forest (ISSG 2005).	MH	MH
3. How much disturbance is required?	Plants are common in disturbed situations where there is temporary or permanent water, such as gullies, rivers, creeks, waterholes (IPIF 1999).	MH	MH
Growth/Competitive			
4. Life form?	It is a woody perennial vine (DNRME 2004). Climber	ML	M
5. Allelopathic properties?	None described in Parsons & Cuthbertson 2001.	L	MH
6. Tolerates herb pressure?	It is poisonous to stock, however, if animal is stressed or other feed is scarce, they may eat it. Biological control agents are being used (DNRME 2004).	MH	M
7. Normal growth rate?	This plant aggressively colonises areas and forms thickets which can smother other vegetation (DNRME 2004). No evidence to suggest that it can exceed other species of the same life form but assumed that the growth rate will equal competitive species of same life form.	MH	M
8. Stress tolerance to frost, drought, w/logg, sal. etc?	Does not occur in areas with more than 100 days frost per annum, and from 50-100 days frost per annum being a less suitable habitat. Needs absence of frequent fires to survive (Mackay 1996). Tolerant to water logging and drought tolerant up to 80 days. Survives in saltmarsh areas (ISSG 2005).	MH	MH
Reproduction			
9. Reproductive system	Propagates by seeds – known to be insect-pollinated. Cannot vegetatively reproduce (Starr , Starr & Loope 2003).	L	MH
10. Number of propagules produced?	Rigid seed pods (mostly grow in pairs) mature about 6 months after flowering and each contain an average of 350 brown seeds but can contain up to 450 seeds (DNRME 2004). Can produce more than 8000 seeds in a single reproductive episode and can set seed at least twice per year (Starr , Starr & Loope 2003).	H	MH
11. Propagule longevity?	Approximately 95% of seeds are viable (DNRME 2004). Seeds remain viable for approximately 12 months (Starr , Starr & Loope 2003).	L	MH
12. Reproductive period?	Individual plants have been known to live for more than 80 years (DNRME 2004).	H	M
13. Time to reproductive maturity?	Plants can begin to reproduce after about 200 days although dependent on soil moisture, it can take more than four years to flower (Starr , Starr & Loope 2003).	H	MH

Invasiveness Assessment Record

Scientific name: *Cryptostegia grandiflora*

Common Name: rubber vine

QUESTION	COMMENTS	RATING	CONFIDENCE
Dispersal			
14. Number of mechanisms?	As each seed has a tuft of long white silky hair, wind and water easily disperse them (via both fresh and salt-water courses) (DNRME 2004). Animals, especially birds, also spread the seed. Seeds can spread in mud sticking to machinery and in the hooves of animals – spreading along watercourses then to pastures and open country (Starr, Starr & Loope 2003).	H	MH
15. How far do they disperse?	As seeds are very light with the tuft to aid dispersal, it is assumed that it is very likely that some propagules will disperse greater than one kilometre. Also bird dispersed (DNRME 2004).	H	M

References cited:

- CRC for Australian Weed Management 2003, *Weed management guide: rubber vine (Cryptostegia grandiflora)*, Natural heritage Trust, Canberra, viewed: 25 October 2005, http://www.weeds.crc.org.au/publications/weed_man_guides.html
- Department of Natural Resources, Mines and Energy 2004, *Rubber vine management: control methods and case studies*, Australian Weeds Committee, Launceston, viewed: 25 October 2005, http://www.weeds.org.au/docs/Rubber_Vine_Mgmt.pdf
- Institute of Pacific Islands Forestry 1999, *Pacific Islands ecosystems at risk: Cryptostegia grandiflora*, Hawaii Ecosystems at Risk, Maui, viewed 25 October 2005, http://www.hear.org/pier/imagepages/thumbnails/cryptostegia_grandiflora.htm
- Invasive Species Specialist Group 2005, Global invasive species database: *Cryptostegia grandiflora*, Invasive Species Specialist Group, Auckland, viewed: 26 October 2005, <http://www.issg.org/database/species/ecology.asp?si=347&fr=1&sts=sss#>
- Mackey, A.P. (ed.) 1996, *Rubber vine (Cryptostegia grandiflora) in Queensland*, Department of Natural Resources and Mines, Brisbane, viewed: 25 October 2005, http://www.nrm.qld.gov.au/pests/management_plans/pdf/rubber_vine_psa.pdf
- Parsons, W.T. & Cuthbertson, E. G. 2001, *Noxious weeds of Australia*, 2nd edn, CSIRO Publishing, Collingwood.
- Russell, B. 2001, *Rubbervine overview*, CSIRO, Entomology, Canberra, viewed: 25 October 2005, <http://www.ento.csiro.au/research/pestmgmt/IPMModellingNetwork/rubbervine.htm>
- Starr, F., Starr, K. & Loope, L. 2003, *Plants of Hawaii reports: Cryptostegia spp.*, Hawaii Ecosystems at Risk, Maui, viewed 25 October 2005, http://www.hear.org/starr/hiplants/reports/html/cryptostegia_spp.htm

Revisions

Date Revised by Revision

Present distribution of *Cryptostegia grandiflora* in Victoria

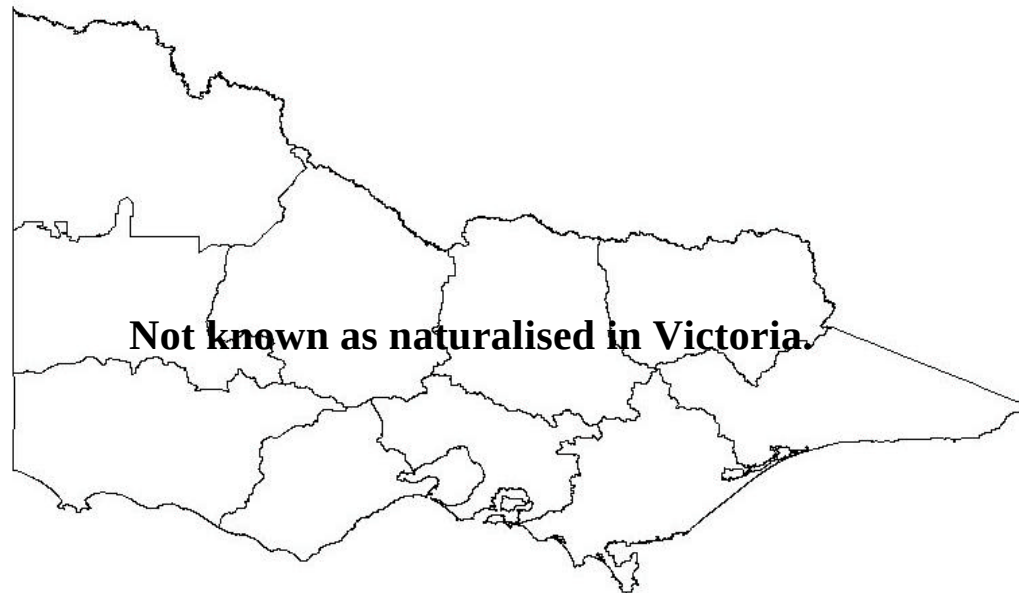
Scientific name: *Cryptostegia grandiflora* R. Br.

Common name(s): rubber vine

Status:

Habitat:

Semi-arid tropics. Found in areas receiving between 400 and 1400 mm of mainly summer rain. Grows on all soil types but germinates on soils retaining moisture. (CRC for Australian Weed Management 2003). Dry forest, roadsides, moist forest, rainforest openings at low elevations. Common in disturbed situations where there is temporary or permanent water, such as along gullies, rivers, creeks, waterholes and in saltmarsh areas. (ISSG 2005)



Potential distribution of *Cryptostegia grandiflora* in Victoria

Scientific name: *Cryptostegia grandiflora* R. Br.

Common name(s): rubber vine

Status:

Habitat:

Semi-arid tropics. Found in areas receiving between 400 and 1400 mm of mainly summer rain. Grows on all soil types but germinates on soils retaining moisture. (CRC for Australian Weed Management 2003). Dry forest, roadsides, moist forest, rainforest openings at low elevations. Common in disturbed situations where there is temporary or permanent water, such as along gullies, rivers, creeks, waterholes and in saltmarsh areas. (ISSG 2005)

Potential distribution produced from CLIMATE modelling refined by applying suitable landuse and vegetation type overlays with CMA boundaries

MAP OVERLAYS USED.

Land Use:

Forest private/public plantation
Pasture dryland / irrigation

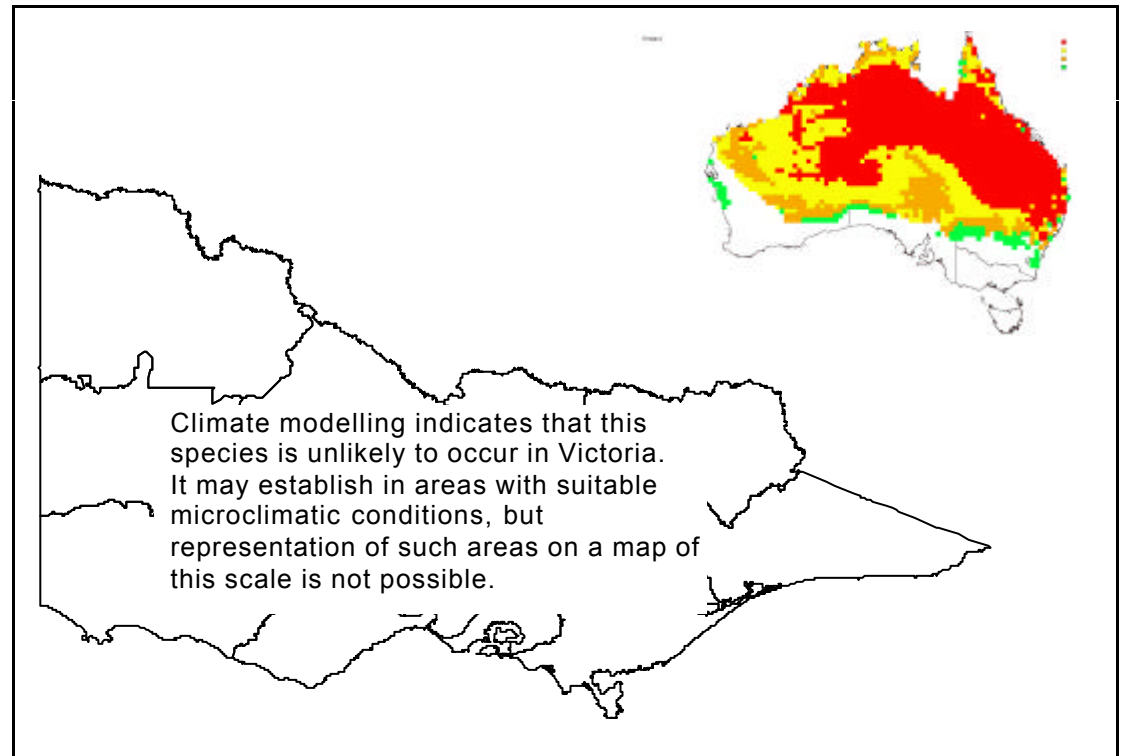
Broad vegetation types

Coastal scrubs and grassland; heathy woodland; lowland forest; heath; swamp scrub; dry foothill forest; moist foothill forest; grassland; plains grassy woodland; valley grassy forest; herb-rich woodland; riverine grassy woodland; riparian forest.

Colours indicate possibility of *Cryptostegia grandiflora* infesting these areas.

 Red	= Very high	 Yellow	= High
 Orange	= Medium	 Green	= Likely

In the non-coloured areas the plant is unlikely to establish as the climate, soil or landuse is not presently suitable.



Impact Assessment Record

Scientific Name: *Cryptostegia grandiflora*

Common name: rubber vine

QUESTION	COMMENTS	RATING	CONFIDENCE
Social			
1. Restrict human access?	"The important properties of rubber vine are its ability to climb over and smother tall trees and to extend into run-down pastures. In such situations it forms dense thickets, particularly along waterways which, being impenetrable to man and beast, restrict access to water" (Parsons & Cuthbertson 2001). Major impediment to access waterways.	H	MH
2. Reduce tourism?	"...it is a twining vine, smothering vegetation. The Undarra Volcanic National Park in Queensland was affected when rubber vine covered the entrance of the volcanic lava tubes, thus decreasing the appeal of this attraction" (ARMCANZ 2001).	H	MH
3. Injurious to people?	"Extracts of the stems are...toxic and the plant has been implicated in human as well as animal deaths. Fortunately rubber vine is unpalatable and seldom eaten, so deaths are few" (Tomley 1998). Potentially fatal for humans.	H	MH
4. Damage to cultural sites?	"In thickets or supported by other vegetation it forms a dense tangled mass, smothering vegetation up to 40 m above the ground" (Tomley 1998). With the smothering habit of rubber vine, infestations on culturally significant vegetation (e.g. historical trees) could have a major impact.	H	MH
Abiotic			
5. Impact flow?	Terrestrial species (Tomley 1998).	L	MH
6. Impact water quality?	'.. severely threatens riverine vegetation, and can potentially displace the plants and animals that inhabit riverbanks, thereby affecting the water quality of streams' (CRC for Australian Weed Management 2003). Potential to have minor effects in dissolved O ₂ .	ML	M
7. Increase soil erosion?	Rubber vine increases soil erosion due to, "...loss of grasses and other ground covers" (ARMCANZ 2001). It commonly occurs along watercourses (Parsons & Cuthbertson 2001), thus there is a high probability for large scale soil movement.	MH	MH
8. Reduce biomass?	"Rubber vine invades and dominates...riverine forest, eucalypt woodland and vine thickets" (Tomley 1998). The smothering nature of rubber vine suggests biomass would increase.	L	MH
9. Change fire regime?	"Heavy grazing and drought reduced the amount of available fuel, and so reduced the frequency and intensity of fires" (Mackey 1996). Although the plant burns vigorously, it requires a significant dry fuel load to cause ignition (Parsons & Cuthbertson 2001). Minor change to frequency of fire.	ML	MH
Community Habitat			
10. Impact on composition (a) high value EVC	The potential for <i>C. grandiflora</i> to establish and naturalise in Victoria is highly unlikely due to ecoclimatic limitations (Mackey 1996). No impact on EVCs in Victoria.	L	M
(b) medium value EVC	The potential for <i>C. grandiflora</i> to establish and naturalise in Victoria is highly unlikely due to ecoclimatic limitations (Mackey 1996). No impact on EVCs in Victoria.	L	M
(c) low value EVC	The potential for <i>C. grandiflora</i> to establish and naturalise in Victoria is highly unlikely due to ecoclimatic limitations (Mackey 1996). No impact on EVCs in Victoria.	L	M
11. Impact on structure?	"Rubber vine invades and dominates...riverine forest, eucalypt woodland and vine thickets. As a result some of these communities could be largely degraded" (Tomley 1998). "It is a vigorous climber which will smother and kill plants and shade out the ground layer; potential to destroy all deciduous vine thickets in Queensland" (ARMCANZ 2001). Major impact on <60% of the floral strata.	MH	MH

Impact Assessment Record

Scientific Name: *Cryptostegia grandiflora*

Common name: rubber vine

QUESTION	COMMENTS	RATING	CONFIDENCE
12. Effect on threatened flora?	The potential for <i>C. grandiflora</i> to establish and naturalise in Victoria is highly unlikely due to ecoclimatic limitations (Mackey 1996). No impact on threatened flora in Victoria.	L	M
Fauna			
13. Effect on threatened fauna?	The potential for <i>C. grandiflora</i> to establish and naturalise in Victoria is highly unlikely due to ecoclimatic limitations (Mackey 1996). No impact on threatened fauna in Victoria	L	M
14. Effect on non-threatened fauna?	See comment in 11 above. "Fauna living in such communities are also threatened. Rubber vine destroys the habitat of the greater glider <i>Petauroides volans</i> Kerr and the squirrel glider <i>Petaurus norfolcensis</i> Kerr" (Tomley 1998). Reduction in habitat leading to reduced numbers but not local extinction.	MH	MH
15. Benefits fauna?	No known benefits.	H	MH
16. Injurious to fauna?	"The plant is highly toxic to cattle, goats, sheep and, especially, horses" (Parsons & Cuthbertson 2001). Potentially injurious to native herbivores.	H	MH
Pest Animal			
17. Food source to pests?	Not known as a food source to pest animals.	L	MH
18. Provides harbor?	'Its effects include ... harbouring feral animals such as wild pigs' (DNRME 2004). Can provide harbour for minor pest spp.	ML	M
Agriculture			
19. Impact yield?	"...there is a direct loss of pasture on better soils where rubber vine competes directly with pasture grasses, [with] dense infestations reducing carrying capacity by nearly 100%" (Tomley 1998). Serious impact on yield.	H	MH
20. Impact quality?	Not a weed of cropping. Not known to affect the quality of other agricultural produce.	L	MH
21. Affect land value?	"Chippendale (1991) reported that landholders perceived that property values...had dropped ...due to infestation by rubber vine. ...landholders recognise that rubber vine is a serious enough problem to affect their capital investment" (Tomley 1998).	H	MH
22. Change land use?	Rubber vine is toxic, it seriously hinders day-to-day stock management of cattle and increases mustering costs (Tomley 1998). With such a serious impact on grazing activities, land may no longer be viable for grazing purposes.	H	MH
23. Increase harvest costs?	"Mustering costs are almost doubled" (Tomley 1998). Major increase in time and labour to muster animals.	H	MH
24. Disease host/vector?	None evident.	L	MH

References cited:

Agriculture and Resource Management Council of Australia & New Zealand, Australian & New Zealand Environment & Conservation Council and Forestry Ministers, 2001, *Weeds of National Significance Rubber Vine (Cryptostegia grandiflora) Strategic Plan*. National Weeds Strategy Executive Committee, Launceston.

Impact Assessment Record

Scientific Name: *Cryptostegia grandiflora*

Common name: rubber vine

CRC for Australian Weed Management , 2003, *Weed management guide: rubber vine (Cryptostegia grandiflora)*, Natural Heritage Trust, Canberra. Available:
http://www.weeds.crc.org.au/publications/weed_man_guides.html

Department of Natural Resources, Mines and Energy , 2004, Rubber vine management: control methods and case studies, Australian Weeds Committee, Launceston. Available:
http://www.weeds.org.au/docs/Rubber_Vine_Mgmt.pdf

Mackey, A.P (ed), 1996, *Rubber Vine in Queensland*. Pest Status Review Series – Land Protection Branch. Queensland Government, Natural Resources and Mines. Available:
<http://www.nrm.qld.gov.au/pests/psas/pdfs/Rubbervine.pdf> Accessed 16/07/03.

Tomley, A.J, 1998, '*Cryptostegia grandiflora* Roxb. ex R.Br,' in *Biology of Australian Weeds*, Vol 2, ed. F.D. Panetta, R.H. Groves and R.C.H. Shepherd, R.G. & F.J. Richardson, Meredith, Victoria

Revisions

Date	Revised by	Revision
11 Aug. 05	TDH	Reference Panetta <i>et al.</i> (1998) changed to Tomley (1998) and details added to references list
11 Aug. 05	TDH	Wording of impact in EVCs and for threatened flora and fauna changed and new reference cited.
23 Nov 05	TS	New reference cited leading to change in score for question 6 (L to ML) and question 18 (L to ML) (added CRC and DNRME references).

Invasiveness Assessment Record

Scientific name: *Cynoglossum creticum*

Common Name: blue hounds's tongue

QUESTION	COMMENTS	RATING	CONFIDENCE
Establishment			
1. Germination requirements?	Germinates in autumn and flowers in spring-summer (CRC for Australian Weed Management 2003). Requires natural seasonal conditions.	MH	M
2. Establishment requirements?	No information available regarding <i>C. creticum</i> although <i>C. officinale</i> (the most closely related species which is also biennial herb found in same habitats) is shade tolerant and can occur in areas of thick litter accumulation (USFS 2003). As <i>C. creticum</i> can also occur in open woodlands, assume it too can establish under a moderate canopy.	M	MH
3. How much disturbance is required?	Invades grasslands. Most commonly grows on disturbed sites such as roadsides, sand dunes or open woodlands, where it establishes and spreads quickly' (CRC for Australian Weed Management 2003). Although prefers disturbed sites, can establish in minor disturbed natural ecosystem.	MH	M
Growth/Competitive			
4. Life form?	A biennial herb (USFS 2003) – life form – other.	L	MH
5. Allelopathic properties?	None described in USFS 2003.	L	MH
6. Tolerates herb pressure?	'leaves contain pyrrolizidine alkaloids that kill cattle and horses. '.. insects tend to avoid the plant because of the alkaloids in its leaves' (CRC for Australian Weed Management 2003). Favoured by heavy grazing as not eaten by animals.	H	M
7. Normal growth rate?	'Invades grasslands and suppresses native grasses'. 'Seedlings are fast growing' (CRC for Australian Weed Management 2003). Assume that plant will equal competitive species of same life form.	MH	M
8. Stress tolerance to frost, drought, w/logg, sal. etc?	'Fire probably top-kills houndstongue plants' (CRC for Australian Weed Management 2003). <i>C. officinale</i> , a closely related species, does not tolerate waterlogging and is frost susceptible (USFS 2003). Insufficient information available on <i>C. creticum</i> . Score as medium	M	MH
Reproduction			
9. Reproductive system	'Spreads by seeds' (CRC for Australian Weed Management 2003). Does not vegetatively reproduce. No evidence in literature to suggest if self or cross-pollinates.	L	M
10. Number of propagules produced?	'.. mature plants each producing several hundred [seeds]' (CRC for Australian Weed Management 2003). Likely that plant produces between 50 to 1000 propagules per flowering event.	ML	M
11. Propagule longevity?	'Plant dies after flowering, but seeds may stay attached until the following spring, delaying germination for a year' (CRC for Australian Weed Management 2003). Viability is two to three years.	L	M
12. Reproductive period?	'Lifecycle that is completed in two years or seasons, with the second season usually devoted to flowering and fruiting' (CRC for Australian Weed Management 2003).	ML	M
13. Time to reproductive maturity?	'Lifecycle that is completed in two years or seasons, with the second season usually devoted to flowering and fruiting' (CRC for Australian Weed Management 2003).	MH	M

Invasiveness Assessment Record

Scientific name: *Cynoglossum creticum*

Common Name: blue hounds's tongue

QUESTION	COMMENTS	RATING	CONFIDENCE
Dispersal			
14. Number of mechanisms?	'In North America cattle and wildlife are important dispersers of the closely related <i>C. officinale</i> .. likely also to be the case in Australia' (CRC for Australian Weed Management 2003). 'Seeds may be transported by animals or people into disturbed areas where they find suitable conditions for germination.'	ML	M
15. How far do they disperse?	'Spread long distances attached to people or animals' (CRC for Australian Weed Management 2003). Very likely that some propagules will disperse greater than 1 km.	H	M

References cited:

CRC for Australian Weed Management 2003, *Weed management guide: Blue hound's tongue (Cynoglossum creticum)*, CRC for Australian Weed Management and the Commonwealth Department of Environment and Heritage, viewed 02 Dec 2005, http://www.weeds.crc.org.au/documents/wmg_blue_hounds_tongue.pdf

Unites States Forestry Service 2003, *Species: Cynoglossum officinale*, United States Department of Agriculture, Forestry Service, viewed 05 Dec 2005, <http://www.fs.fed.us/database/feis/plants/forb/cynoff/all.html>

Revisions

Date	Revised by	Revision

Present distribution of *Cynoglossum creticum* in Victoria

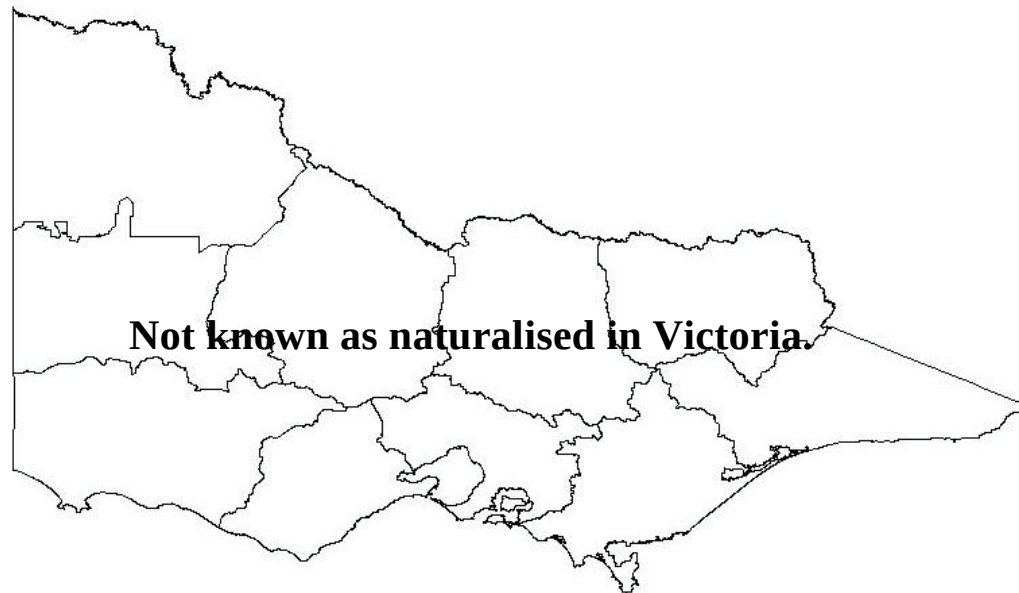
Scientific name: *Cynoglossum creticum* Mill.

Common name(s): blue hound's tongue

Status:

Habitat:

Found in warm temperate grassland communities which occur at altitudes of 0 – 1000m. Most commonly occurs on disturbed sites such as roadsides, sand dunes or open woodlands. Tolerant of dry conditions. (CRC for Australian Weed Management 2003)



Potential distribution of *Cynoglossum creticum* in Victoria

Scientific name: *Cynoglossum creticum* Mill.

Common name(s): blue hound's tongue

Status:

Habitat:

Found in warm temperate grassland communities which occur at altitudes of 0 – 1000m. Most commonly occurs on disturbed sites such as roadsides, sand dunes or open woodlands. Tolerant of dry conditions. (CRC for Australian Weed Management 2003)

Potential distribution produced from CLIMATE modelling refined by applying suitable landuse and vegetation type overlays with CMA boundaries

MAP OVERLAYS USED.

Land Use:

Horticulture
Pasture dryland

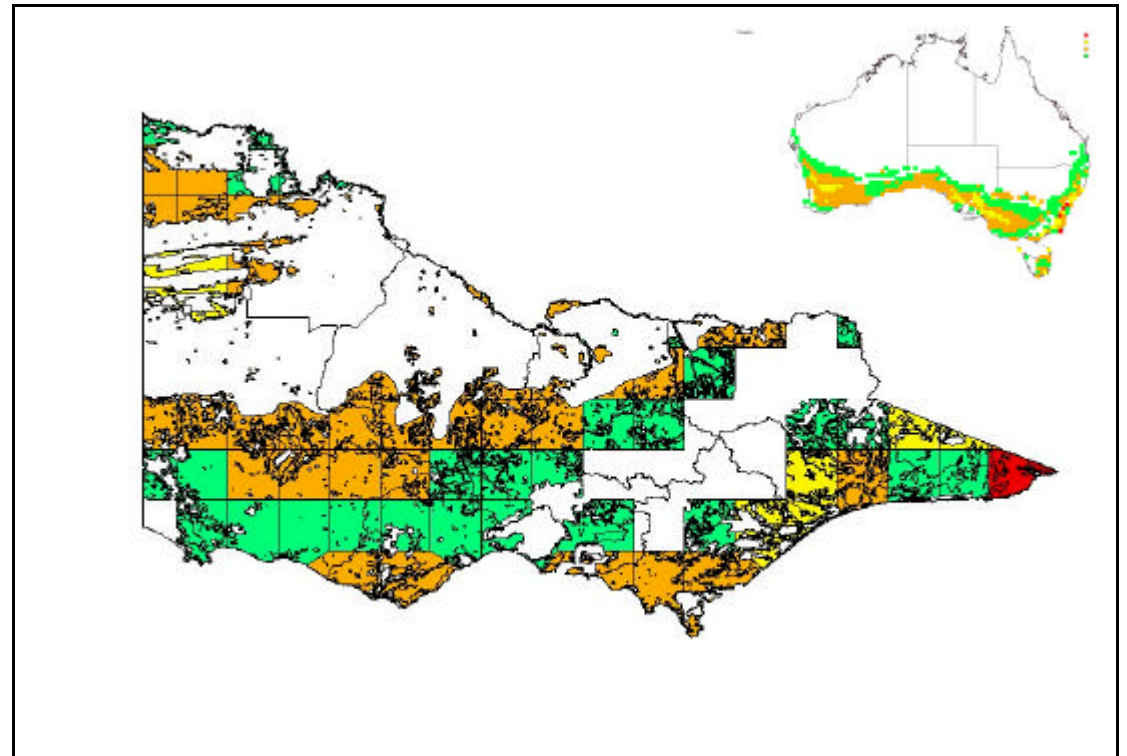
Broad vegetation types

Coastal scrubs and grassland; coastal grassy woodland; lowland forest; box ironbark forest; inland slopes woodland; dry foothill forest; moist foothill forest; grassland; plains grassy woodland; valley grassy forest; riverine grassy woodland; riparian forest; rainshadow woodland; mallee; mallee woodland; Wimmera/mallee woodland

Colours indicate possibility of *Cynoglossum creticum* infesting these areas.

 Red	= Very high	 Yellow	= High
 Orange	= Medium	 Green	= Likely

In the non-coloured areas the plant is unlikely to establish as the climate, soil or landuse is not presently suitable.



Impact Assessment Record

Scientific Name: *Cynoglossum creticum*

Common name: blue hound's tongue

QUESTION	COMMENTS	RATING	CONFIDENCE
Social			
Restrict human access?	'Although flowers have hooks, the plants only grow up to 600mm high' (CRC for Australian Weed Management 2003). Weed would have a minimal or negligible impact on human access.	L	M
Reduce tourism?	Grows up to 600mm high and typically occurs on roadsides, pastures, grasslands. Plant also has hooks (CRC for Australian Weed Management 2003). Visitor may be aware of weed but not bothered or activity not inhibited.	M	M
Injurious to people?	'Flowers are covered in hooks' (CRC for Australian Weed Management 2003). These hooks can attach to people at certain times of year.	ML	M
Damage to cultural sites?	Not likely to cause damage to cultural sites.	L	M
Abiotic			
Impact flow?	Terrestrial species	L	M
Impact water quality?	Terrestrial species	L	M
Increase soil erosion?	Plant has long taproot. Although the plant dies off after flowering and may leave some of the ground exposed, (CRC for Australian Weed Management 2003) low probability of large scale soil movement.	L	M
Reduce biomass?	'It invades grasslands and suppresses native grasses' (CRC for Australian Weed Management 2003). Grows up to 600mm high so likely that biomass will increase.	L	M
Change fire regime?	Plants die off after flowering. Invades grasslands and suppresses native grasses. Weed may have small or negligible effect on fire risk.	L	M
Community Habitat			
Impact on composition (a) high value EVC	EVC= Damp sands herb rich woodland (V); CMA=East Gippsland; Bioreg=East Gippsland Lowland; CLIMATE potential=VH. 'Invades grasslands and suppresses native grasses' (CRC for Australian Weed Management 2003). Minor displacement of some dominant species within the groundcover layer.	ML	M
(b) medium value EVC	EVC= Valley grassy forest (D); CMA=East Gippsland; Bioreg=East Gippsland Upland; CLIMATE potential=VH. 'Invades grasslands and suppresses native grasses' (CRC for Australian Weed Management 2003). Major displacement of some dominant species within the groundcover layer.	MH	M
(c) low value EVC	EVC= Coastal Banksia Woodland (LC); CMA=East Gippsland; Bioreg=East Gippsland Lowland; CLIMATE potential=VH. 'Invades grasslands and suppresses native grasses' (CRC for Australian Weed Management 2003). Minor displacement of some dominant species within the groundcover layer.	ML	M
Impact on structure?	'Invades grasslands and suppresses native grasses' (CRC for Australian Weed Management 2003). When occurring in open areas where only one stratum present likely to have a minor effect on greater than 60% of the layers (MH). In open woodlands, likely to have a minor effect on 20-60% of the floral strata (ML). Therefore score as medium.	M	M

Impact Assessment Record

Scientific Name: *Cynoglossum creticum*

Common name: blue hound's tongue

QUESTION	COMMENTS	RATING	CONFIDENCE
Effect on threatened flora?	This species is not documented as posing an additional risk to threatened flora.	MH	L
Fauna			
Effect on threatened fauna?	This species is not documented as posing an additional risk to threatened fauna.	MH	L
Effect on non-threatened fauna?	Weed is mostly a pasture weed so greatest impact on domesticated animals (CRC for Australian Weed Management 2003). 'Horses may be especially affected when restricted to small, infested area without other desirable forage' (Graham & Johnson 2003). Weed may have a minor effect on fauna spp.	ML	M
Benefits fauna?	Weed not documented to provide benefit to indigenous fauna.	H	M
Injurious to fauna?	Leaves are toxic to livestock. 'Plant has burrs that attach to cattle, causing irritation'. 'Leaves contain pyrrolizidine alkaloids that kill cattle and horses' (CRC for Australian Weed Management 2003).	H	M
Pest Animal			
Food source to pests?	Not known to be a food source to pests.	L	M
Provides harbor?	Not known to provide harbour for pest spp.	L	M
Agriculture			
Impact yield?	'Grazing and dairy farms throughout [humid temperate and subhumid zones of Australia] would potentially be affected by a loss of pasture and stock' (CRC for Australian Weed Management 2003). Potential to have a major impact on quantity of produce (5-20%).	MH	M
Impact quality?	<i>C. officinale</i> (a closely related species) also has prickly seeds which 'are very hard to remove after they cling to animals, thus lowering the wool value of sheep'. If the leaves of <i>C. creticum</i> are contained in hay or chopped forage, then possible that the cattle and horses will die if they eat it. Leaves have a serious toxicity effect (CRC for Australian Weed Management 2003). Likely to have a major impact on quality of produce.	MH	M
Affect land value?	No evidence to suggest the weed will affect land value.	L	M
Change land use?	Not known to cause a change in priority of land use.	L	M
Increase harvest costs?	No evidence to suggest the weed will increase the cost of harvest.	L	M
Disease host/vector?	Not a known host or vector for disease.	L	M

Impact Assessment Record

Scientific Name: *Cynoglossum creticum*

Common name: blue hound's tongue

References cited:

CRC for Australian Weed Management 2003, *Weed management guide: Blue hound's tongue (Cynoglossum creticum)*, CRC for Australian Weed Management and the Commonwealth Department of Environment and Heritage, viewed 02 Dec 2005, http://www.weeds.crc.org.au/documents/wmg_blue_hounds_tongue.pdf

Graham, J and Johnson, W.S. 2003, *Managing houndstongue*, University of Nevada, Cooperative Extension, viewed 03 Dec 2005, <http://www.unce.unr.edu/publications/FS03/FS0349.pdf>

Revisions

Date	Revised by	Revision

Invasiveness Assessment Record

Scientific name: *Cyperus teneristolon*

Common Name: cyperus

QUESTION	COMMENTS	RATING	CONFIDENCE
Establishment			
1. Germination requirements?	'It regrows and germinates during the spring months' (CRC for Australian Weed Management 2003). Requires natural seasonal conditions.	MH	M
2. Establishment requirements?	Generally grows in damp areas. '..has been observed breaking through special weedproof matting in a revegetation area alongside a creek line'. 'Shows a preference for damp open areas or rock outcrops ..grows beneath an overstorey of eucalypt [in the Blue Mountains] .. but will also grow in full-sun environments' (CRC for Australian Weed Management 2003). Can establish without additional factors.	H	M
3. How much disturbance is required?	Found alongside creeks. '. A weed of both semi-arid agricultural crops and damp grasslands' (CRC for Australian Weed Management 2003). Can establish in relatively intact or only minor disturbed natural ecosystems.	MH	M
Growth/Competitive			
4. Life form?	A perennial sedge (CRC for Australian Weed Management 2003). Life form– other.	ML	M
5. Allelopathic properties?	None described in CRC for Australian Weed Management 2003.	L	M
6. Tolerates herb pressure?	No information regarding herbivory pressure. Score medium	M	L
7. Normal growth rate?	Insufficient information to determine this species rate of growth. Score medium.	M	L
8. Stress tolerance to frost, drought, w/logg, sal. etc?	'Does not go dormant during winter, but slows its growth during cool periods' (CRC for Australian Weed Management 2003). Has been found in Katoomba in the blue mountains. Likes damp areas and grows in monsoonal climates. Tolerates waterlogging. Not enough information to determine whether this species is susceptible to drought.	M	M
Reproduction			
9. Reproductive system	Reproduction 'via rhizome, stolons and seed' (CRC for Australian Weed Management 2003). Both vegetative and sexual reproduction.	H	M
10. Number of propagules produced?	'The main flowering spike is .. made up of many tiny spikelets ..the fruit contains one seed' (CRC for Australian Weed Management 2003). By counting the spikelets on the photo from the NCW Beadle Herbarium photograph, it would appear that one spike contains approximately 100 spikelets.	ML	M
11. Propagule longevity?	'Not much is known about the life cycle of <i>C. teneristolon</i> in Australia' (CRC for Australian Weed Management 2003). Not enough definitive information. Score as medium.	M	M
12. Reproductive period?	A perennial sedge (CRC for Australian Weed Management 2003), therefore likely to live greater than 3 years. No definitive information to establish whether it would produce propagules for 10 years or more. Therefore medium high.	MH	M
13. Time to reproductive maturity?	'Not much is known about the life cycle of <i>C. teneristolon</i> in Australia' (CRC for Australian Weed Management 2003). Not enough definitive information. Score as medium.	M	M

Invasiveness Assessment Record

Scientific name: Cyperus teneristolon

Common Name: cyperus

QUESTION	COMMENTS	RATING	CONFIDENCE
Dispersal			
14. Number of mechanisms?	Stolons and rhizomes break off and propagate downstream (CRC for Australian Weed Management 2003). Propagules spread by water.	MH	M
15. How far do they disperse?	' .. in Australia .. has spread 2km from its source since approximately 1999' (CRC for Australian Weed Management 2003). Few propagules will spread greater than 1km but many will reach 200-1000m.	MH	M

References cited:

CRC for Australian Weed Management 2003, *Weed management guide: cyperus (Cyperus teneristolon)*, CRC for Australian Weed Management and the Commonwealth Department of Environment and Heritage, viewed 05 Dec 2005, http://www.weeds.crc.org.au/documents/wmg_cyperus.pdf

Revisions

Date	Revised by	Revision

Present distribution of *Cyperus teneristolon* in Victoria

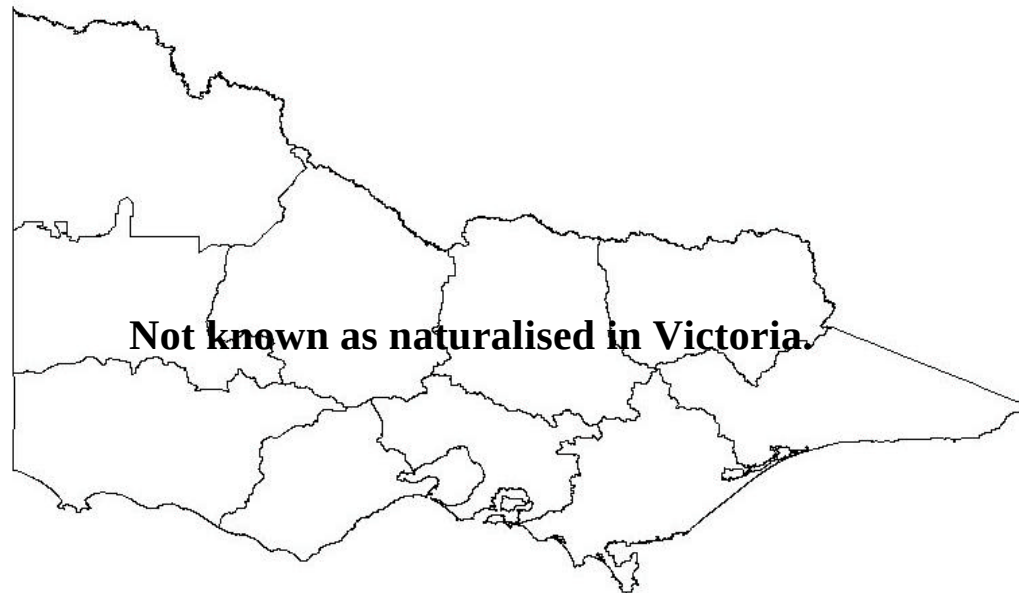
Scientific name: *Cyperus teneristolon* Mattf. & Kuk.

Common name(s): cyperus

Status:

Habitat:

Native and naturalised populations of *C. teneristolon* suggest it prefers highland areas with soils that are sandy and poor in nutrients. Weed of crops in semi-arid Kenyan and Tanzanian highlands. Shows a preference for damp open areas or rocky outcrops. In Australia, grows beneath an overstorey of eucalypt along a creek (CRC for Australian Weed Management 2003).



Potential distribution of *Cyperus teneristolon* in Victoria

Scientific name: *Cyperus teneristolon* Mattf. & Kuk.

Common name(s): cyperus

Status:

Habitat:

Native and naturalised populations of *C. teneristolon* suggest it prefers highland areas with soils that are sandy and poor in nutrients. Weed of crops in semi-arid Kenyan and Tanzanian highlands. Shows a preference for damp open areas or rocky outcrops. In Australia, grows beneath an overstorey of eucalypt along a creek (CRC for Australian Weed Management 2003).

Potential distribution produced from CLIMATE modelling refined by applying suitable landuse and vegetation type overlays with CMA boundaries

MAP OVERLAYS USED.

Land Use:

Broadacre cropping
Horticulture
Pasture irrigation

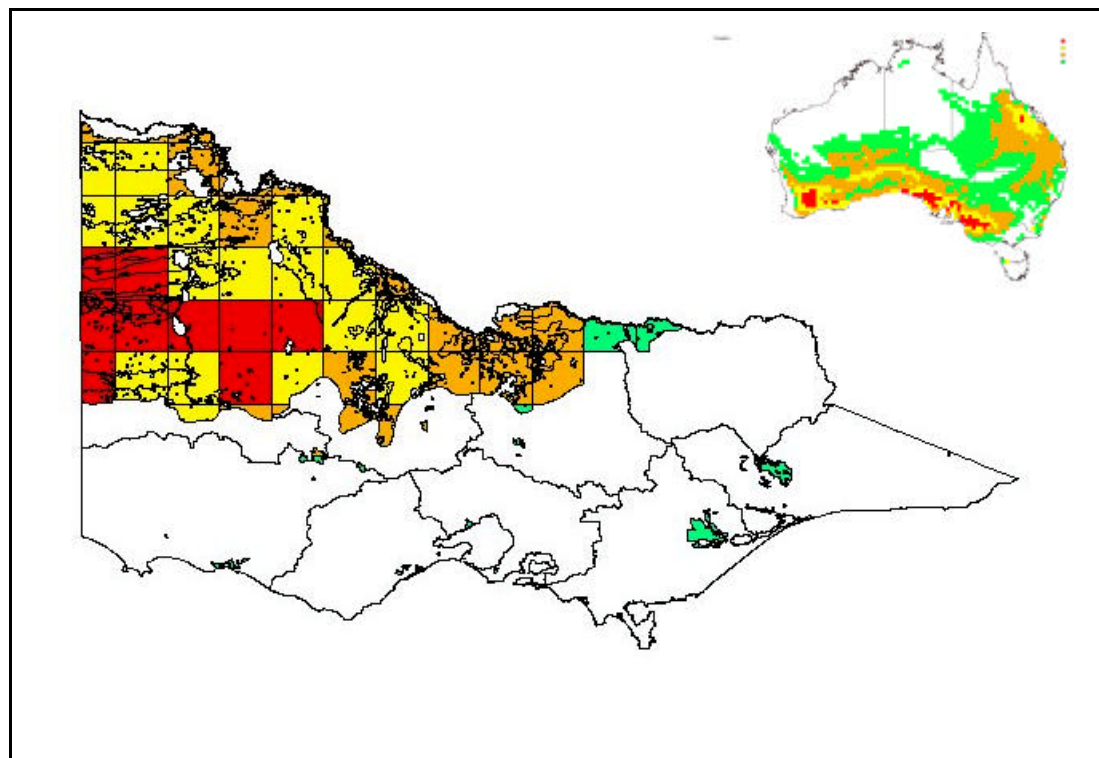
Broad vegetation types

Heath; Swamp scrub; Moist foothill forest; Montane moist forest;
Sub-alpine woodland; Riparian forest; Mallee; Mallee heath

Colours indicate possibility of *Cyperus teneristolon* infesting these areas.

 Red	= Very high	 Yellow	= High
 Orange	= Medium	 Green	= Likely

In the non-coloured areas the plant is unlikely to establish as the climate, soil or landuse is not presently suitable.



Impact Assessment Record

Scientific Name: *Cyperus teneristolon*

Common name: cyperus

QUESTION	COMMENTS	RATING	CONFIDENCE
Social			
Restrict human access?	Grows up to 500mm. Although found around creeks unlikely that the weed would impede access (CRC for Australian Weed Management 2003). Minimal or negligible impact.	L	M
Reduce tourism?	Due to the areas the weed is known to grow (around creeks, agricultural areas) (CRC for Australian Weed Management 2003), weeds would not be obvious to the 'average' visitor.	L	M
Injurious to people?	Weeds not known to be injurious to people.	L	M
Damage to cultural sites?	Weeds not known to occur on cultural sites.	L	M
Abiotic			
Impact flow?	Terrestrial species	L	M
Impact water quality?	Terrestrial species	L	M
Increase soil erosion?	Evergreen plant. 'Roots are fibrous and the plant has an extensive rhizome system' (CRC for Australian Weed Management 2003). Low probability of large scale soil movement.	L	M
Reduce biomass?	Shows preference for damp open areas and rocky outcrops (CRC for Australian Weed Management 2003). Likely that the biomass would increase.	L	M
Change fire regime?	Weed tends to grow in riparian areas. Unlikely that the weed would have any effect on fire risk.	L	M
Community Habitat			
Impact on composition (a) high value EVC	EVC= Parilla Mallee (E); CMA=Mallee; Bioreg=Lowan Mallee; CLIMATE potential=H. Impact unknown.	M	L
(b) medium value EVC	EVC= Grassy Riverine Forest (D); CMA=Mallee; Bioreg=Lowan Mallee; CLIMATE potential=H. Impact unknown.	M	L
(c) low value EVC	EVC= Dune Field Heathland (LC); CMA=Mallee; Bioreg=Lowan Mallee; CLIMATE potential=H. Impact unknown.	M	L
Impact on structure?	'Shows a preference for damp open areas or rock outcrops.' In the Blue Mountains, it 'grows beneath an overstorey of eucalypt along Yosemite Creek but will also grow in full-sun environments' (CRC for Australian Weed Management 2003). Likely to have at least a minor impact on the lower stratum.	ML	M
Effect on threatened flora?	No information available.	MH	L

Impact Assessment Record

Scientific Name: *Cyperus teneristolon*

Common name: cyperus

QUESTION	COMMENTS	RATING	CONFIDENCE
Fauna			
Effect on threatened fauna?	No information available.	MH	L
Effect on non-threatened fauna?	No documented evidence that the weed has an effect on non-threatened fauna spp.	L	M
Benefits fauna?	Not known to provide benefits to indigenous fauna.	H	M
Injurious to fauna?	Not known to be toxic to fauna.	L	M
Pest Animal			
Food source to pests?	Not a known food source to pest animal spp.	L	M
Provides harbor?	Not known to provide harbour for pest spp.	L	M
Agriculture			
Impact yield?	‘..has become a significant weed of crops of the East African highlands, in particular Kenya... seen as a potential threat to Australia’s environment and agricultural productivity’. ‘..locally common and important as a weed of crops in the highlands [of Kenya and Tanzania]’ (CRC for Australian Weed Management 2003). Insufficient information available to determine the extent of impact. Score medium.	M	M
Impact quality?	No evidence to suggest that this weed would impact upon the quality of crops.	L	M
Affect land value?	Not known to affect the value of land.	L	M
Change land use?	Weed not documented to cause a change in priority of land use.	L	M
Increase harvest costs?	No documented evidence to suggest that the weed increases the cost of harvest.	L	M
Disease host/vector?	Not a known host or vector for disease.	L	M

Impact Assessment Record

Scientific Name: *Cyperus teneristolon*

Common name: cyperus

References cited:

CRC for Australian Weed Management 2003, *Weed management guide: cyperus (Cyperus teneristolon)*, CRC for Australian Weed Management and the Commonwealth Department of Environment and Heritage, viewed 05 Dec 2005, http://www.weeds.crc.org.au/documents/wmg_cyperus.pdf

Revisions

Date	Revised by	Revision

Invasiveness Assessment Record

Scientific name: *Disa bracteata*

Common Name: African weed-orchid

QUESTION	COMMENTS	RATING	CONFIDENCE
Establishment			
1. Germination requirements?	Sprouts in early spring (DNRE 2002). Requires natural seasonal conditions for germination.	MH	M
2. Establishment requirements?	Can grow in both shade and open ground (Muyt 2001). Can establish under a moderate canopy.	MH	MH
3. How much disturbance is required?	Generally grows in disturbed areas and can be found in 'woodlands, heathlands, roadsides, grazing lands' (Muyt 2001). 'Invades bushland and pastures' (DNRE 2002). Can establish in minor disturbed ecosystems.	MH	M
Growth/Competitive			
4. Life form?	'Deciduous perennial terrestrial orchid with underground tubers' (DNRE 2002). Geophyte	ML	M
5. Allelopathic properties?	None described.	L	M
6. Tolerates herb pressure?	Known to be 'consumed by sheep, cattle, horses and kangaroos' (Dempster 2005). Capable of seed production under moderate herbivory pressure.	MH	ML
7. Normal growth rate?	'Competes and excludes smaller indigenous flora including orchids, lilies and grasses' (Muyt 2001). Growth rate will exceed most other species of same life form.	H	MH
8. Stress tolerance to frost, drought, w/logg, sal. etc?	'.. tolerant to fire, frost and drought' (Dempster 2005). No documented evidence of plants response to waterlogging or salinity. Score medium.	M	ML
Reproduction			
9. Reproductive system	Self-pollinated (Muyt 2001). Has tubers (DNRE 2002). Capable of sexual and vegetative reproduction.	H	M
10. Number of propagules produced?	'..each capsule containing up to a thousand seeds' (Muyt 2001). 'Each plant produces tens of thousands of airborne seeds' (DNRE 2002).	H	MH
11. Propagule longevity?	Seeds remain viable for seven years (Muyt 2001).	ML	MH
12. Reproductive period?	Perennial plant, producing flowers in second or third year (Muyt 2001). No documented evidence that plant produces viable propagules for greater than 10 years.	MH	MH
13. Time to reproductive maturity?	Produces flower in second or third year (Muyt 2001).	ML	MH
Dispersal			
14. Number of mechanisms?	Known to be both wind and water dispersed. '.. likely to be introduced accidentally on vehicles and machinery .. spread by seeds on clothing, shoes and camping equipment' Seeds are 'minute and dust-like .. may be blown many km' (DNRE 2002).	H	M

Invasiveness Assessment Record

Scientific name: *Disa bracteata*

Common Name: African weed-orchid

QUESTION	COMMENTS	RATING	CONFIDENCE
15. How far do they disperse?	Estimated that spread in South Australia has averaged 10km per year. Seeds are 'minute and dust-like .. may be blown many km' (DNRE 2002).	H	M

References cited:

Dempster, A. 2005, 'South African orchid', *Friends of Grampians Newsletter*, viewed 07 Dec 2005, <http://home.vicnet.net.au/~gariwerd/News.htm>

Department of Natural Resources and Environment 2002, *Landcare notes: South African weed orchid: identification*, Department of Primary Industries, Victoria, viewed 06 Dec 2005, [http://www.dpi.vic.gov.au/DPI/nreninf.nsf/9e58661e880ba9e44a256c640023eb2e/1c5c119d4b2c71d9ca256e720024ed4b/\\$FILE/LC0273.pdf](http://www.dpi.vic.gov.au/DPI/nreninf.nsf/9e58661e880ba9e44a256c640023eb2e/1c5c119d4b2c71d9ca256e720024ed4b/$FILE/LC0273.pdf)

Muyt, A. 2001, *Bush invaders of south-east Australia*, R.G. & F. J Richardson, Melbourne.

Revisions

Date	Revised by	Revision

Present distribution of *Disa bracteata* in Victoria

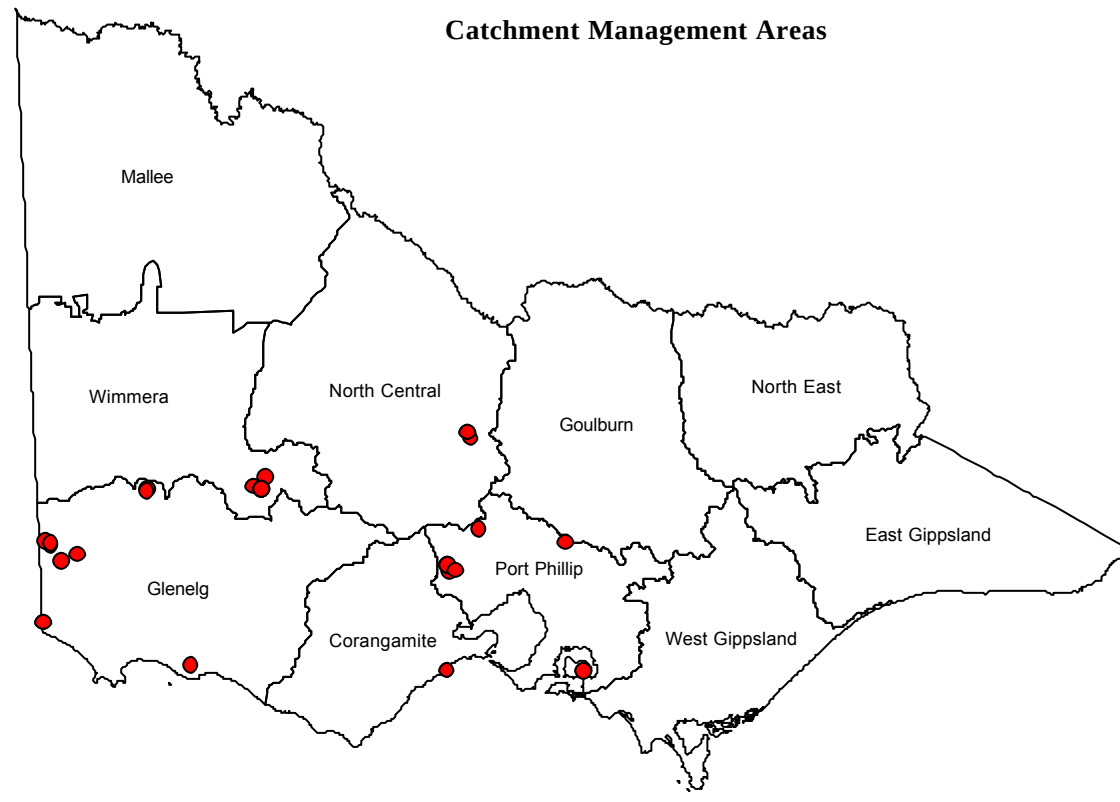
Scientific name: *Disa bracteata* Sw.

Common name(s): South African weed orchid

Status:

Habitat:

Semi-arid regions in a wide range of soils. In its native South Africa, African weed orchid grows in the Cape Province flourishing from sea-level to mountains 2000m high. It is a weed of gardens, open paddocks and roadsides. Favours grasslands, woodlands, particularly disturbed areas (Roberston 1991).



Potential distribution of *Disa bracteata* in Victoria

Scientific name: *Disa bracteata* Sw.

Common name(s): South African weed orchid

Status:

Habitat:

Semi-arid regions in a wide range of soils. In its native South Africa, African weed orchid grows in the Cape Province flourishing from sea-level to mountains 2000m high. It is a weed of gardens, open paddocks and roadsides. Favours grasslands, woodlands, particularly disturbed areas (Roberston 1991).

Potential distribution produced from CLIMATE modelling refined by applying suitable landuse and vegetation type overlays with CMA boundaries

MAP OVERLAYS USED.

Land Use:

Pasture dryland; pasture irrigation

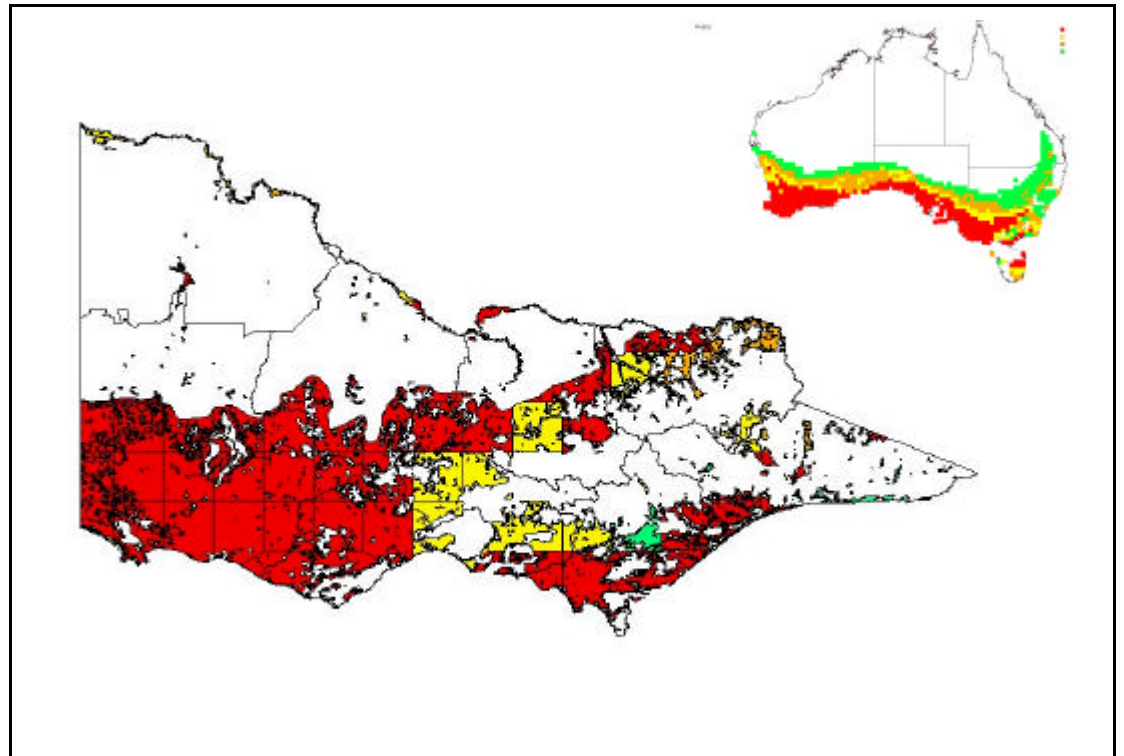
Broad vegetation types

Coastal scrubs and grassland; coastal grassy woodland; lowland forest; heath; box ironbark forest; inland slopes woodland; sedge-rich woodland; dry foothill forest; montane dry woodland; grassland; plains grassy woodland; valley grassy forest; herb-rich woodland; montane grassy woodland; riverine grassy woodland; riparian forest; rainshadow woodland; mallee; mallee heath; boinka-raak; mallee woodland; Wimmera/ mallee woodland

Colours indicate possibility of *Disa bracteata* infesting these areas.

 Red	= Very high	 Yellow	= High
 Orange	= Medium	 Green	= Likely

In the non-coloured areas the plant is unlikely to establish as the climate, soil or landuse is not presently suitable.



Impact Assessment Record

Scientific Name: Disa bracteata

Common name: African weed-orchid

QUESTION	COMMENTS	RATING	CONFIDENCE
Social			
1. Restrict human access?	Grows up to 50cm tall (DNRE 2002). Weed would not restrict human access.	L	M
2. Reduce tourism?	As the plant can outcompete other species and is common in grassy paddocks and previously cleared areas (DNRE 2002), it is likely that the weeds would have a minor effect on the aesthetics of the land but would not inhibit activities.	ML	M
3. Injurious to people?	Plant not documented to be injurious or toxic in any way.	L	M
4. Damage to cultural sites?	Not known to occur at cultural sites.	L	M
Abiotic			
5. Impact flow?	Terrestrial species.	L	M
6. Impact water quality?	Terrestrial species.	L	M
7. Increase soil erosion?	The plant has tubers (1-3) and also fleshy side roots (DNRE 2002). Unlikely that the plant would contribute to soil erosion.	L	M
8. Reduce biomass?	'Competes and excludes smaller indigenous flora including orchids, lilies and grasses' (Muyt 2001). Biomass may increase.	L	MH
9. Change fire regime?	Tuberous plant with fleshy stems (DNRE 2002) . Although deciduous, unlikely to change the frequency or intensity of fires.	L	M
Community Habitat			
10. Impact on composition (a) high value EVC	EVC=Herb-rich Foothill Forest (V); CMA=Glenelg-Hopkins; Bioreg=Victorian Volcanic Plain; CLIMATE potential=VH. 'Competes and excludes smaller indigenous flora including orchids, lilies and grasses' (Muyt 2001). Major displacement of some dominant species in the lower strata.	MH	MH
(b) medium value EVC	EVC=Herb-rich Foothill Forest (D); CMA=Glenelg-Hopkins; Bioreg=Victorian Volcanic Plain; CLIMATE potential=VH. 'Competes and excludes smaller indigenous flora including orchids, lilies and grasses' (Muyt 2001). Major displacement of some dominant species in the lower strata.	MH	MH
(c) low value EVC	EVC=Lowland Forest (LC); CMA=Glenelg-Hopkins; Bioreg=Victorian Volcanic Plain; CLIMATE potential=VH. 'Competes and excludes smaller indigenous flora including orchids, lilies and grasses' (Muyt 2001). Major displacement of some dominant species in the lower strata.	MH	MH
11. Impact on structure?	'Competes and excludes smaller indigenous flora including orchids, lilies and grasses' (Muyt 2001). Likely to have a major effect on the lower strata.	MH	MH

Impact Assessment Record

Scientific Name: Disa bracteata

Common name: African weed-orchid

QUESTION	COMMENTS	RATING	CONFIDENCE
12. Effect on threatened flora?	In South Australia ' <i>Monadenia bracteata</i> has already been found in the close vicinity of nationally declared rare and endangered species such as <i>Psoralea parva</i> (small scurf-pea) and <i>Drosera praefolia</i> (Tepper's sundew) (Prescott 1997). In Victoria, <i>D. bracteata</i> has been found in several locations including the Victorian Volcanic Plains, where threatened flora such as basalt greenhood and tough scurf pea exist (DPI 2003).	H	M
Fauna			
13. Effect on threatened fauna?	This species is not documented as posing an additional risk to threatened fauna	MH	L
14. Effect on non-threatened fauna?	Not documented to have an effect on fauna spp.	L	M
15. Benefits fauna?	Not known to benefit fauna.	L	M
16. Injurious to fauna?	Not known to be injurious to fauna.	L	M
Pest Animal			
17. Food source to pests?	Plant not known to be a food source to pests.	L	M
18. Provides harbor?	Plant not known to provide harbour for pets species.	L	M
Agriculture			
19. Impact yield?	Not a weed of agriculture.	L	M
20. Impact quality?	Not a weed of agriculture.	L	M
21. Affect land value?	Weed not known to affect land value.	L	M
22. Change land use?	Weed not documented to cause a change in priority of land use.	L	M
23. Increase harvest costs?	Not a weed of agriculture.	L	M
24. Disease host/vector?	Not a known host or vector for diseases of agriculture.	L	M

Impact Assessment Record

Scientific Name: Disa bracteata

Common name: African weed-orchid

References cited:

Department of Natural Resources and Environment 2002, *Landcare notes: South African weed orchid: identification*, Department of Primary Industries, Victoria, viewed 06 Dec 2005, [http://www.dpi.vic.gov.au/DPI/nreninf.nsf/9e58661e880ba9e44a256c640023eb2e/1c5c119d4b2c71d9ca256e720024ed4b/\\$FILE/LC0273.pdf](http://www.dpi.vic.gov.au/DPI/nreninf.nsf/9e58661e880ba9e44a256c640023eb2e/1c5c119d4b2c71d9ca256e720024ed4b/$FILE/LC0273.pdf)

Department of Primary Industries 2003, *Biodiversity action planning – Strategic overview for the Victorian Volcanic Plain bioregion*, Victorian Resources Online, Department of Primary Industries, viewed 10 Jan 2006, <http://chln11/dpi/vro/vrosite.nsf/40a2f70b889ac885ca256656002ed378/4867f29e759a381cca256dd90075a9b3?OpenDocument>

Muyt, A. 2001, *Bush invaders of south-east Australia*, R.G. & F. J Richardson, Melbourne.

Prescott, A 1997, *An ecologists's view of Monadenia bracteata in South Australia*, NOSSA – Orchid Conservation, viewed 12 Dec 2005, <http://www.anos.org.au/groups/southaustralia/nossa-a.htm>

Revisions

Date	Revised by	Revision

Invasiveness Assessment Record

Scientific name: *Dittrichia viscosa*

Common Name: false yellowhead

QUESTION	COMMENTS	RATING	CONFIDENCE
Establishment			
1. Germination requirements?	'Germination generally takes place following rainfall and can be quite prolific when fire or mechanical disturbance create bare ground' (CRC for Australian Weed Management 2003). Opportunistic germinator.	H	M
2. Establishment requirements?	Requires light to establish (Doussi & Thanos 1997).	ML	H
3. How much disturbance is required?	'.. occasionally found in swamps but mainly occurs in highly disturbed areas such as roadsides, railway lines, fire breaks and walking trails' (CRC for Australian Weed Management 2003). Can establish in minor disturbed natural ecosystem.	MH	M
Growth/Competitive			
4. Life form?	Perennial soft-wooded shrub (CRC for Australian Weed Management 2003). Life form – other	L	M
5. Allelopathic properties?	'.. known to release substances that inhibit the germination of nearby plants' (CRC for Australian Weed Management 2003). Allelopathic properties seriously affecting some plants.	MH	M
6. Tolerates herb pressure?	Known to be toxic to stock (CRC for Australian Weed Management 2003). Favoured by heavy grazing as not eaten by animals/ insects.	H	M
7. Normal growth rate?	Insufficient documented evidence to determine growth rate.	M	L
8. Stress tolerance to frost, drought, w/logg, sal. etc?	'..can grow and flower in saline conditions'. Has been found in swamps – tolerant to waterlogging (Curadi et al 2005). May be susceptible to drought and / or frost but insufficient information.	M	L
Reproduction			
9. Reproductive system	Reproduces by seed only. Not known if self or cross-pollination or both (CRC for Australian Weed Management).	L	M
10. Number of propagules produced?	'.. a prolific seed producer' (CRC for Australian Weed Management 2003). 'By estimation a medium sized plant may produce an average of 600-700 flowers per year each giving rise to about 50 viable seeds' (Mifsud 2005).	H	M
11. Propagule longevity?	'Seeds of the closely related stinkwort <i>Dittrichia graveolens</i> are viable for about three years' (CRC for Australian Weed Management 2003). No documented evidence on viability of <i>D. viscosa</i> propagules.	M	L
12. Reproductive period?	Perennial shrub. Plant produces viable propagules for more than 3 years (CRC for Australian Weed Management 2003).	MH	M
13. Time to reproductive maturity?	Insufficient information to determine time to reach reproductive maturity.	M	L
Dispersal			
14. Number of mechanisms?	Spread by wind, water, attached to machinery (CRC for Australian Weed Management 2003). Very light wind dispersed seeds.	H	M

Invasiveness Assessment Record

Scientific name: *Dittrichia viscosa*

Common Name: false yellowhead

QUESTION	COMMENTS	RATING	CONFIDENCE
15. How far do they disperse?	'Seed dispersal is aided by the 'pappus' .. which catches the wind and can assist flotation' (CRC for Australian Weed Management 2003). Very likely that some propagules will disperse greater than 1 km.	H	M

References cited:

CRC for Australian Weed Management 2003, *Weed management guide: False yellowhead (Dittrichia viscosa)*, CRC for Australian Weed Management and the Commonwealth Department of Environment and Heritage, viewed 09 Dec 2005, http://www.weeds.crc.org.au/documents/wmg_false_yellowhead.pdf

Curadi, M., Graifenberg, A., Magnani, G. and Giustiniani, L. 2005, 'Growth and element allocation in tissues of *Inula viscosa* in sodic-saline conditions: a candidate for programs of desertification control', *Arid Land Research Management*, vol. 19, no. 3, viewed 09 Dec 2005, <http://taylorandfrancis.metapress.com>

Doussi, M.A. and Thanos, C.A. 1997, 'Ecophysiology of seed germination in composites inhabiting fire-prone Mediterranean ecosystems', in R.H. Ellis, M. Black, A.J. Murdoch, T.D. Hong (eds), *Basic and applied aspects of seed biology*, Kluwer Academic Publishers, Dordrecht.

Mifsud, S. 2005, False yellowhead, MaltaWilsPlants.com, viewed 11 Dec 2005, http://www.marz-kreations.com/WildPlants/ASTR/Dittrichia_viscosa.html

Revisions

Date	Revised by	Revision

Present distribution of *Dittrichia viscosa* in Victoria

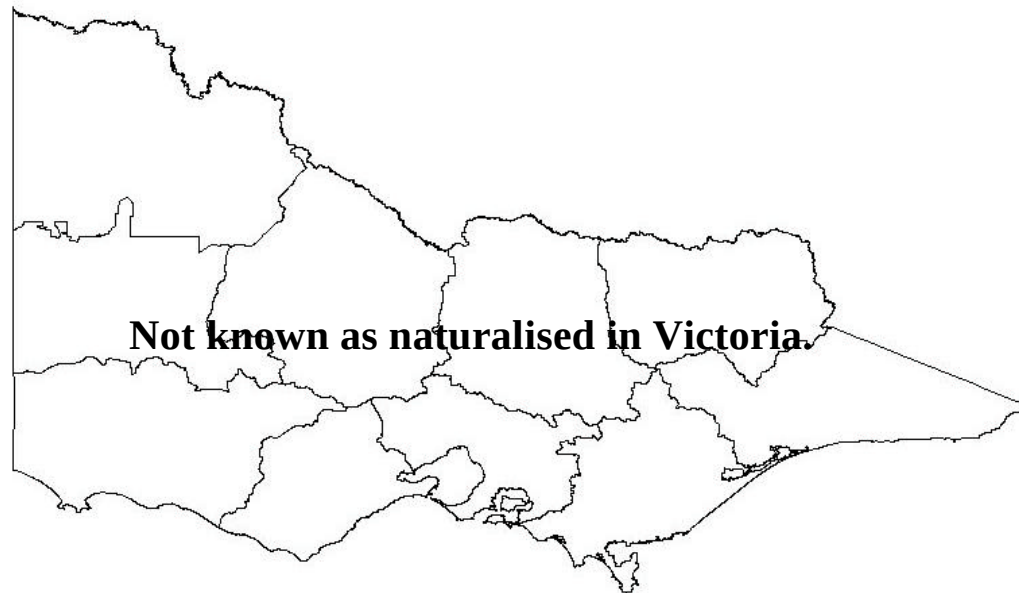
Scientific name: *Dittrichia viscosa* (L.) Greuter

Common name(s): false yellowhead

Status:

Habitat:

Roadsides, gardens, waste ground, stony hillsides, often in moist situations by rivulets or springs. Sea level to 1500 metres. (Meikle 1985). Usually prefers but not restricted to high rainfall areas. Found on clay and sandy soils. In southwestern Western Australia found in highly disturbed sites including road verges, firebreaks and walking trails. In bushland, found in disturbed sites in swamps (CRC for Australian Weed Management 2003).



Potential distribution of *Dittrichia viscosa* in Victoria

Scientific name: *Dittrichia viscosa* (L.) Greuter

Common name(s): false yellowhead

Status:

Habitat:

Roadsides, gardens, waste ground, stony hillsides, often in moist situations by rivulets or springs. Sea level to 1500 metres. (Meikle 1985). Usually prefers but not restricted to high rainfall areas. Found on clay and sandy soils. In southwestern Western Australia found in highly disturbed sites including road verges, firebreaks and walking trails. In bushland, found in disturbed sites in swamps (CRC for Australian Weed Management 2003).

Potential distribution produced from CLIMATE modelling refined by applying suitable landuse and vegetation type overlays with CMA boundaries

MAP OVERLAYS USED.

Land Use:

Pasture dryland
Pasture irrigation

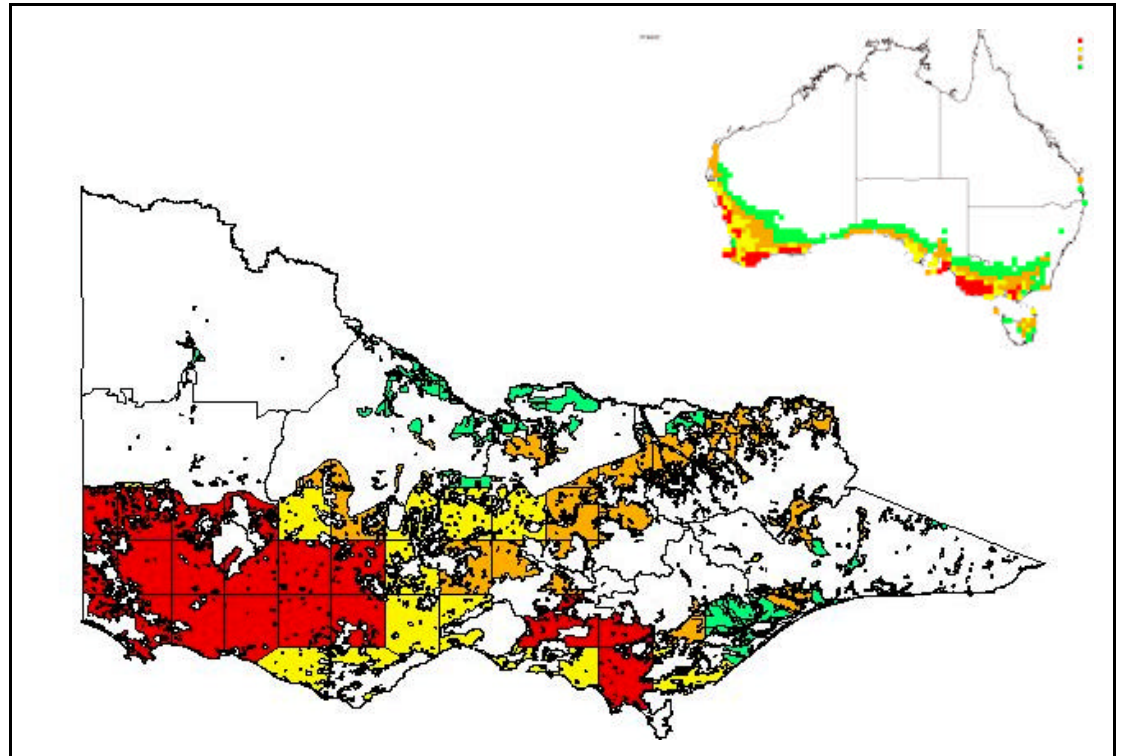
Broad vegetation types

Coastal scrubs and grassland; Swamp scrub; Grassland; Plains grassy woodland; Riverine grassy woodland; Riparian forest; Wimmera/Mallee woodland.

Colours indicate possibility of *Dittrichia viscosa* infesting these areas.

Red	= Very high	Yellow	= High
Orange	= Medium	Green	= Likely

In the non-coloured areas the plant is unlikely to establish as the climate, soil or landuse is not presently suitable.



Impact Assessment Record

Scientific Name: *Dittrichia viscosa*

Common name: false yellowhead

QUESTION	COMMENTS	RATING	CONFIDENCE
Social			
1. Restrict human access?	Shrub that grows between 1 to 1.5 metres tall and 1metre wide (CRC for Australian Weed Management 2003). Likely that the weed would have a low nuisance value.	ML	M
2. Reduce tourism?	In WA it has been found on walking trails. ‘.. infestations of false yellowhead would detract from the aesthetic and natural values of bushland and could reduce its tourism appeal’ (CRC for Australian Weed Management 2003). Likely that some recreational uses affected.	MH	M
3. Injurious to people?	‘It can also cause contact dermatitis in people’. ‘ stems and leaves are covered with glandular hairs which exude a sticky foul-smelling oil [which] can cause allergic reactions’ (CRC for Australian Weed Management 2003). Toxic properties at most times of the year.	MH	M
4. Damage to cultural sites?	Due to the areas in which <i>D. viscosa</i> is known to grow, it is unlikely to have an effect on cultural sites.	L	M
Abiotic			
5. Impact flow?	Terrestrial species.	L	M
6. Impact water quality?	Terrestrial species.	L	M
7. Increase soil erosion?	‘.. roots can be quite substantial, even in small plants’ (CRC for Australian Weed Management 2003). Occasionally found in swamp areas but assume low probability of large scale soil movement as shrub grows to 1m wide and doesn’t leave bare soil exposed.	L	M
8. Reduce biomass?	Has a ‘high fresh biomass production’ (Curadi <i>et al</i> 2005). Likely that the biomass would increase.	L	H
9. Change fire regime?	No data available on changes to fire regime. Assume no effect.	L	L
Community Habitat			
10. Impact on composition (a) high value EVC	EVC=Plains Grassy Woodland (E), CMA=Glenelg-Hopkins, Bioreg.=Dundas Tablelands, CLIMATE=VH. Grows in swamps, roadsides, wastelands. Occurs with other shrubs and ground layers. Allelopathic effects inhibit other plants from germinating but do not kill off existing vegetation (CRC for Australian Weed Management 2003). Minor displacement of some dominant species.	ML	M
(b) medium value EVC	EVC=Riparian Scrub (D), CMA=Glenelg-Hopkins, Bioreg.=Glenelg Plain, CLIMATE=VH. Grows in swamps, roadsides, wastelands. Occurs with other shrubs and ground layers. Allelopathic effects inhibit other plants from germinating but do not kill off existing vegetation (CRC for Australian Weed Management 2003). Minor displacement of some dominant species.	ML	M
(c) low value EVC	EVC=Riparian Forest(LC), CMA=West Gippsland, Bioreg.=Highlands- Southern Fall, CLIMATE=VH. Grows in swamps, roadsides, wastelands. Occurs with other shrubs and ground layers. Allelopathic effects inhibit other plants from germinating but do not kill off existing vegetation (CRC for Australian Weed Management 2003). Minor displacement of some dominant species.	ML	M

Impact Assessment Record

Scientific Name: *Dittrichia viscosa*

Common name: false yellowhead

QUESTION	COMMENTS	RATING	CONFIDENCE
11. Impact on structure?	Grows in swamps, roadsides, wastepoles. Occurs with other shrubs and ground layers. Allelopathic effects inhibit other plants from germinating but do not kill off existing vegetation (CRC for Australian Weed Management 2003). Likely to have a minor effect on strata.	ML	M
12. Effect on threatened flora?	No information available.	MH	L
Fauna			
13. Effect on threatened fauna?	No information available.	MH	L
14. Effect on non-threatened fauna?	Usually occurs in highly disturbed areas such as roadsides, railway lines, fire breaks and walking trails (CRC for Australian Weed Management 2003). Although has allelopathic properties that inhibit the germination of nearby plants, unlikely to cause a reduction in habitat, food or shelter.	L	M
15. Benefits fauna?	No known benefits.	H	M
16. Injurious to fauna?	'Stock that eat the flower heads of <i>D. graveolens</i> can develop enteritis ...thought that <i>D. viscosa</i> would have similar impacts on grazing animals' (CRC for Australian Weed Management 2003). Toxic with the potential to harm fauna species.	MH	M
Pest Animal			
17. Food source to pests?	Not a known food source to pests.	L	M
18. Provides harbor?	Not known to provide harbour for pest species.	L	M
Agriculture			
19. Impact yield?	Not a weed of cropping or pastures.	L	M
20. Impact quality?	Not a weed of cropping or pastures.	L	M
21. Affect land value?	Not likely to have an effect on land value.	L	M
22. Change land use?	Weed not likely to cause a change in priority of land use.	L	M
23. Increase harvest costs?	Not a weed of cropping or pastures.	L	M
24. Disease host/vector?	Not a known host or vector for diseases of agriculture.	L	M

Impact Assessment Record

Scientific Name: *Dittrichia viscosa*

Common name: false yellowhead

References cited:

- CRC for Australian Weed Management 2003, *Weed management guide: False yellowhead (Dittrichia viscosa)*, CRC for Australian Weed Management and the Commonwealth Department of Environment and Heritage, viewed 09 Dec 2005, http://www.weeds.crc.org.au/documents/wmg_false_yellowhead.pdf
- Curadi, M., Graifenberg, A., Magnani, G. and Giustiniani, L. 2005, 'Growth and element allocation in tissues of *Inula viscosa* in sodic-saline conditions: a candidate for programs of desertification control', *Arid Land Research Management*, vol. 19, no. 3, viewed 09 Dec 2005, <http://taylorandfrancis.metapress.com>

Revisions

Date	Revised by	Revision

Invasiveness Assessment Record

Scientific name: *Gymnocoronis spilanthoides*

Common Name: Senegal tea plant

QUESTION	COMMENTS	RATING	CONFIDENCE
Establishment			
1. Germination requirements?	'Although most seeds germinate in spring, some germination continues sporadically throughout summer.' 'Fragments quickly develop adventitious roots and new stems when they come to rest, forming new colonies' (Parsons & Cuthbertson 2001).	H	MH
2. Establishment requirements?	Although plant is shade tolerant at some stage of its life cycle (PIER 2001) requires a lot of light to establish.	ML	MH
3. How much disturbance is required?	'.. confined to wet marshy soils and still or very slowly flowing waters' (Parsons & Cuthbertson 2001). 'Margins of dams and creeks' 'Grows in wetlands, particularly degraded waterways' (CRC for Australian Weed Management 2003). Can establish in minor disturbed natural ecosystem.	MH	MH
Growth/Competitive			
4. Life form?	Perennial emergent herb which forms rounded bushes (Parsons & Cuthbertson 2001). Semi-aquatic.	H	MH
5. Allelopathic properties?	None described in references consulted.	L	M
6. Tolerates herb pressure?	An aquarium plant. Assume that plant is capable of flowering under moderate herbivory pressure but no documented evidence. Score medium.	M	M
7. Normal growth rate?	Plant is fast-growing (Weber 2003). 'An extremely hardy plant with a growth rate exceeding 15cm a week in fertile situations' (Parsons & Cuthbertson 2001). Rapid growth rate that will exceed most other species of same life form.	H	MH
8. Stress tolerance to frost, drought, w/logg, sal. etc?	Tolerant to waterlogging . Freshwater herb – may be susceptible to salinity. Susceptible to drought. Found in 'humid tropics, subtropics and warm-temperate regions'. May be susceptible to frost. (CRC for Australian Weed Management 2003). Maybe tolerant of one stress. Susceptible to at least two.	L	M
Reproduction			
9. Reproductive system	Reproduces vegetatively and by seed (Parsons & Cuthbertson 2001), although research into seed production around Brisbane is very low (CRC for Australian Weed Management 2003).	H	MH
10. Number of propagules produced?	Insufficient documentation to determine number of propagules produced per flowering event. Score medium.	M	L
11. Propagule longevity?	Insufficient information to determine longevity of propagules. Score medium.	M	L
12. Reproductive period?	Species can form self-sustaining monocultures (Parsons & Cuthbertson 2001).	H	MH
13. Time to reproductive maturity?	Minimum generative period is less than one year (PIER 2001).	H	MH

Invasiveness Assessment Record

Scientific name: *Gymnocoronis spilanthoides*

Common Name: Senegal tea plant

QUESTION	COMMENTS	RATING	CONFIDENCE
Dispersal			
14. Number of mechanisms?	'The seeds of Senegal tea plant are relatively heavy and not adapted for wind dispersal.... fall close to the parent plant and remain where they fall, or are dispersed in flowing water or mud sticking to animal hooves' (Parsons & Cuthbertson 2001). Spread by transport of machinery (CRC for Australian Weed Management 2003).	MH	MH
15. How far do they disperse?	'The seeds of Senegal tea plant are relatively heavy and not adapted for wind dispersal....fall close to the parent plant and remain where they fall, or are dispersed in flowing water or mud sticking to animal hooves' (Parsons & Cuthbertson 2001). Very few to none will disperse to 1km, most 20-200m.	ML	MH

References cited:

CRC for Australian Weed Management 2003, *Weed management guide, Senegal tea plant* (Gymnocoronis spilanthoides), CRC for Australian Weed Management and the Commonwealth Department of Environment and Heritage, viewed 23 Jan 2006, http://www.weeds.crc.org.au/documents/wmg_senegal_tea.pdf

Pacific Island Ecosystems at Risk 2001, *Risk Assessment: Gymnocoronis spilanthoides*, United States Forestry Service, viewed 06 Feb 2006, <http://www.hear.org/pier/wra/australia/gyspi-wra.htm>

Parsons, W.T. & Cuthbertson, E.G. 2001, *Noxious weeds of Australia*, 2nd ed., CSIRO Publishing, Collingwood.

Weber, E. 2003, *Invasive plant species of the world: A reference guide to environmental weeds*, CABI Publishing, Wallingford.

Revisions

Date	Revised by	Revision

Present distribution of *Gymnocoronis spilanthoides* in Victoria

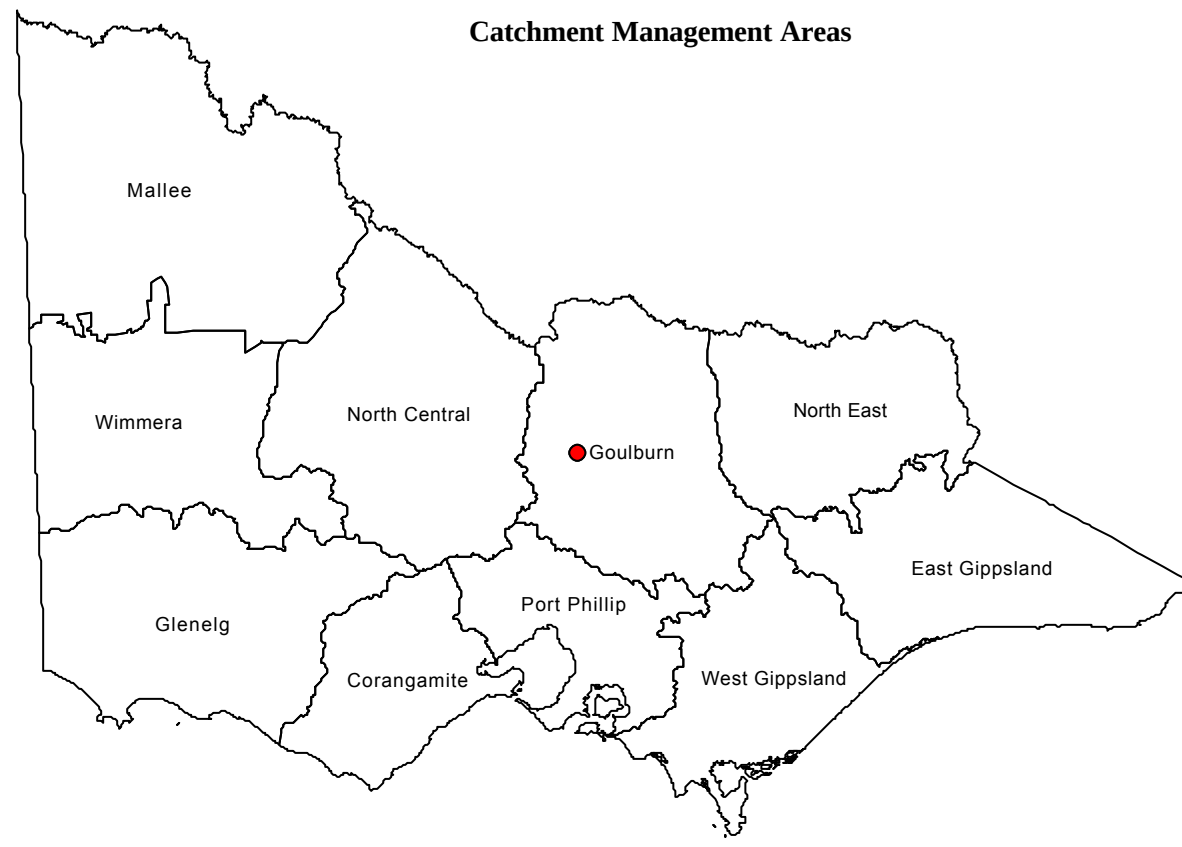
Scientific name: *Gymnocoronis spilanthoides* DC.

Common name(s): Senegal tea plant, temple plant

Status:

Habitat:

Humid tropics, subtropics and warm-temperate regions. Confined to wet marshy soils and still or very slowly flowing waters. (Parsons & Cuthbertson 2001)



Potential distribution of *Gymnocoronis spilanthoides* in Victoria

Scientific name: *Gymnocoronis spilanthoides* DC.

Common name(s): Senegal tea plant, temple plant

Status:

Habitat:

Humid tropics, subtropics and warm-temperate regions. Confined to wet marshy soils and still or very slowly flowing waters. (Parsons & Cuthbertson 2001)

Potential distribution produced from CLIMATE modelling refined by applying suitable landuse and vegetation type overlays with CMA boundaries

MAP OVERLAYS USED.

Land Use:

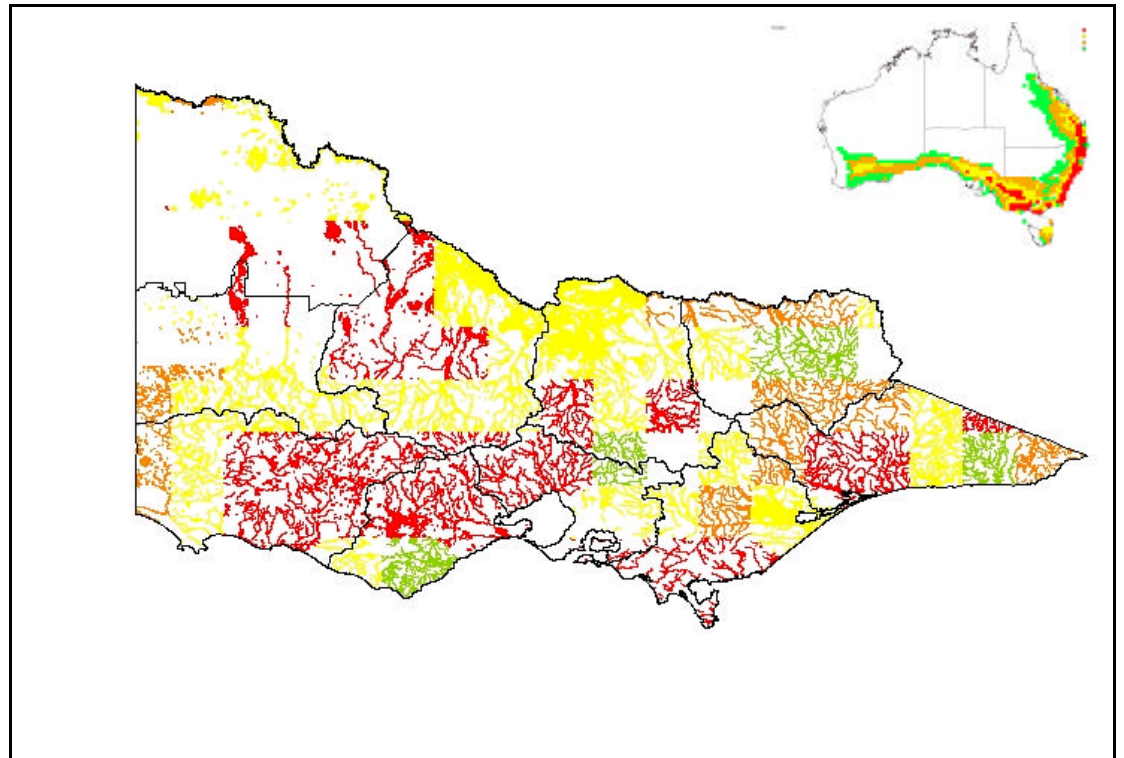
Broad vegetation types

Swamp scrub; riverine grassy woodland; riparian forest.

Colours indicate possibility of *Gymnocoronis spilanthoides* infesting these areas.

■ Red	= Very high	■ Yellow	= High
■ Orange	= Medium	■ Green	= Likely

In the non-coloured areas the plant is unlikely to establish as the climate, soil or landuse is not presently suitable.



Impact Assessment Record

Scientific Name: *Gymnocoronis spilanthoides*

Common name: Senegal tea plant

QUESTION	COMMENTS	RATING	CONFIDENCE
Social			
1. Restrict human access?	Stems from 1 to 1.5m long (Parsons & Cuthbertson 2001). ‘..commonly found as a scrambling form extending from the edge of waterways and forming dense tangled mats in open water’ (CRC for Australian Weed Management 2003). Impedes individual access.	ML	MH
2. Reduce tourism?	‘It impedes water flow, navigation and recreation’ (Parsons & Cuthbertson 2001). Some recreational uses affected.	MH	MH
3. Injurious to people?	Plant not noted to be toxic or injurious to people (PIER 2001).	L	MH
4. Damage to cultural sites?	Semi-aquatic plant. Negligible effect on aesthetics of site.	L	MH
Abiotic			
5. Impact flow?	‘Dense infestations impede water flow and growth of native plant species’ (Weber 2003). ‘.. effects of flooding are worse because infestations block drainage channels’ (CRC for Australian Weed Management 2003). Major impact on surface or subsurface flow.	MH	MH
6. Impact water quality?	‘Water quality may decline if large amounts of Senegal tea plant die off and rot under water’ (CRC for Australian Weed Management 2003). Noticeable but minor effects in either dissolved oxygen or light levels.	ML	M
7. Increase soil erosion?	‘Numerous, finely fibrous adventitious roots developing from the nodes’. Plants are dormant during winter. (Parsons & Cuthbertson 2001). Moderate probability of large scale soil movement.	ML	MH
8. Reduce biomass?	‘.. can rapidly cover water bodies with a floating mat, excluding other plants’ (CRC for Australian Weed Management 2003). Plants are dormant during winter (Parsons & Cuthbertson 2001). Biomass may increase at certain times of year.	L	MH
9. Change fire regime?	Semi-aquatic. Negligible effect on fire risk.	L	MH
Community Habitat			
10. Impact on composition (a) high value EVC	Basin=Tambo River- Nicholson river (ISC=excellent); CMA=East Gippsland; CLIMATE=VH; Can rapidly cover water bodies with a floating mat, excluding other plants’ (CRC for Australian Weed Management 2003). Displaces all species within a layer.	H	M
(b) medium value EVC	Aquatic species. All Victorian water bodies considered to comprise high value EVCs only (Weiss pers. coms.)i.	L	H
(c) low value EVC	Aquatic species. All Victorian water bodies considered to comprise high value EVCs only (Weiss pers. coms.)ii.	L	H
11. Impact on structure?	‘.. can rapidly cover water bodies with a floating mat, excluding other plants’ (CRC for Australian Weed Management 2003). Major effect on less than 60% of floral strata.	MH	M

Impact Assessment Record

Scientific Name: *Gymnocoronis spilanthoides*

Common name: Senegal tea plant

QUESTION	COMMENTS	RATING	CONFIDENCE
12. Effect on threatened flora?	This species is not documented as posing an additional risk to threatened flora.	MH	L
Fauna			
13. Effect on threatened fauna?	This species is not documented as posing an additional risk to threatened fauna.	MH	L
14. Effect on non-threatened fauna?	'.. can rapidly cover water bodies with a floating mat, excluding other plants and the animals that rely on them' (CRC for Australian Weed management 2003). Minor reduction in habitat / food / shelter.	ML	M
15. Benefits fauna?	Weed not known to benefit or facilitate the establishment of indigenous fauna.	H	M
16. Injurious to fauna?	Plant is not toxic and does not have burrs or spines which affect indigenous fauna.	L	M
Pest Animal			
17. Food source to pests?	Not documented to be a food source to pests.	L	M
18. Provides harbor?	Plant not documented to provide harbour for serious pests.	L	M
Agriculture			
19. Impact yield?	Not a weed of agriculture.	L	M
20. Impact quality?	Not a weed of agriculture.	L	M
21. Affect land value?	Weed not documented to affect land value.	L	M
22. Change land use?	Weed not known to cause a change in priority of land use.	L	M
23. Increase harvest costs?	Not a weed of agriculture.	L	M
24. Disease host/vector?	Weed not known to be an alternative host or vector for diseases of agriculture.	L	M

References cited:

CRC for Australian Weed Management 2003, Weed management guide, Senegal tea plant (*Gymnocoronis spilanthoides*), CRC for Australian Weed Management and the Commonwealth Department of Environment and Heritage, viewed 23 Jan 2006, http://www.weeds.crc.org.au/documents/wmg_senegal_tea.pdf

Impact Assessment Record

Scientific Name: *Gymnocoronis spilanthoides*

Common name: Senegal tea plant

Pacific Island Ecosystems at Risk 2001, *Risk Assessment: Gymnocoronis spilanthoides*, United States Forestry Service, viewed 06 Feb 2006,
<http://www.hear.org/pier/wra/australia/gyspi-wra.htm>

Parsons, W.T. & Cuthbertson, E.G. 2001, *Noxious weeds of Australia*, 2nd ed., CSIRO Publishing, Collingwood.

Weber, E. 2003, *Invasive plant species of the world: A reference guide to environmental weeds*, CABI Publishing, Wallingford.

Revisions

Date	Revised by	Revision

i Weiss, J. Project Leader, Pest Plant Impact Assessment. DPI, Frankston. Tel 9785 0111. (11/07/03)

ii Weiss, J. Project Leader, Pest Plant Impact Assessment. DPI, Frankston. Tel 9785 0111. (11/07/03)

Invasiveness Assessment Record

Scientific name: *Hedera helix*

Common Name: English ivy

QUESTION	COMMENTS	RATING	CONFIDENCE
Establishment			
1. Germination requirements?	Although light may inhibit germination to some extent (Metcalf 2005), <i>H. helix</i> is an opportunistic germinator.	H	H
2. Establishment requirements?	'Will grow in variable light conditions but prefers shade, damp soils, and a moist, cool environment' (ISSG 2005).	MH	MH
3. How much disturbance is required?	Occurs in 'coastland, estuaries, natural forest, planted forests, riparian zones, urban areas, wetlands... where it infests woodlands, forest edges, fields, hedgerows, coastal areas, salt marsh edges' (ISSG 2005).	MH	MH
Growth/Competitive			
4. Life form?	Variable in life form – 'it may be a perennial herbaceous vine or climber, a herb, a woody subshrub, or rarely a tree' (Metcalf 2005).	ML	H
5. Allelopathic properties?	'Known to produce chemicals that kill other plants (Allelopathy)' (Blood 2001).	MH	MH
6. Tolerates herb pressure?	A number of vertebrate species browse <i>H. helix</i> . In England, where sheep graze ivy, colonisation of grassland areas and woodland understorey may be severely restricted. A wide range of invertebrates are found to feed on <i>H. helix</i> (Metcalf 2005). Consumed and recovers slowly.	ML	H
7. Normal growth rate?	Fast growing (ISSG 2005). Moderately rapid growth that will equal competitive species of same life form.	MH	MH
8. Stress tolerance to frost, drought, w/logg, sal. etc?	Low tolerance of fire when it does burn. Not tolerant of waterlogged soils. Tolerant of seasonal drought. (Metcalf 2005). 'Tolerates.. frost to at least -15°C. drought ...salt' (Blood 2001) Tolerant of 1 stress, susceptible to at least 2. Tolerant to at least 2, susceptible to at least 2.	ML	H
Reproduction			
9. Reproductive system	Produces both vegetatively and by seeds (insect-pollinated) (ISSG 2005).	H	MH
10. Number of propagules produced?	Fruits have one to a few hard, stone-like seeds (ISSG 2005) Rooting is prolific on all stems (Muyt 2001).	H	MH
11. Propagule longevity?	'Dormancy of cleaned seeds may last for up to 30 days; cleaning results in nearly 100% germination .. Seeds planted within the fruits may remain dormant for up to 57 days, associated with c. 40% seed mortality' (Metcalf 2005). Also produces vegetatively.	L	H
12. Reproductive period?	Longevity of plants in Australia is unknown but can live for 400 years in Europe (Muyt 2001).	H	MH
13. Time to reproductive maturity?	Flowers are produced from about 10 years old (Metcalf 2005).	L	H
Dispersal			
14. Number of mechanisms?	Dispersed by birds, foxes and possibly water (Muyt 2001).	H	MH

Invasiveness Assessment Record

Scientific name: *Hedera helix*

Common Name: English ivy

QUESTION	COMMENTS	RATING	CONFIDENCE
15. How far do they disperse?	Dispersed by birds, foxes and possibly water (Muyt 2001). Very likely that some propagules will disperse greater than 1 km.	H	MH

References cited:

Invasive Species Specialist Group 2005, *Hedera helix* (vine, climber), Global Invasive Species Database, The World Conservation Union, viewed 15 Dec 2005, <http://www.issg.org/database/species/ecology.asp?si=469&fr=1&sts=sss>

Metcalf, D. J. 2005, 'Hedera helix L.', *Journal of Ecology*, vol. 93, pp. 632-648.

Muyt, A. 2001, *Bush invaders of south-east Australia*, R.G. & F.J. Richardson, Melbourne.

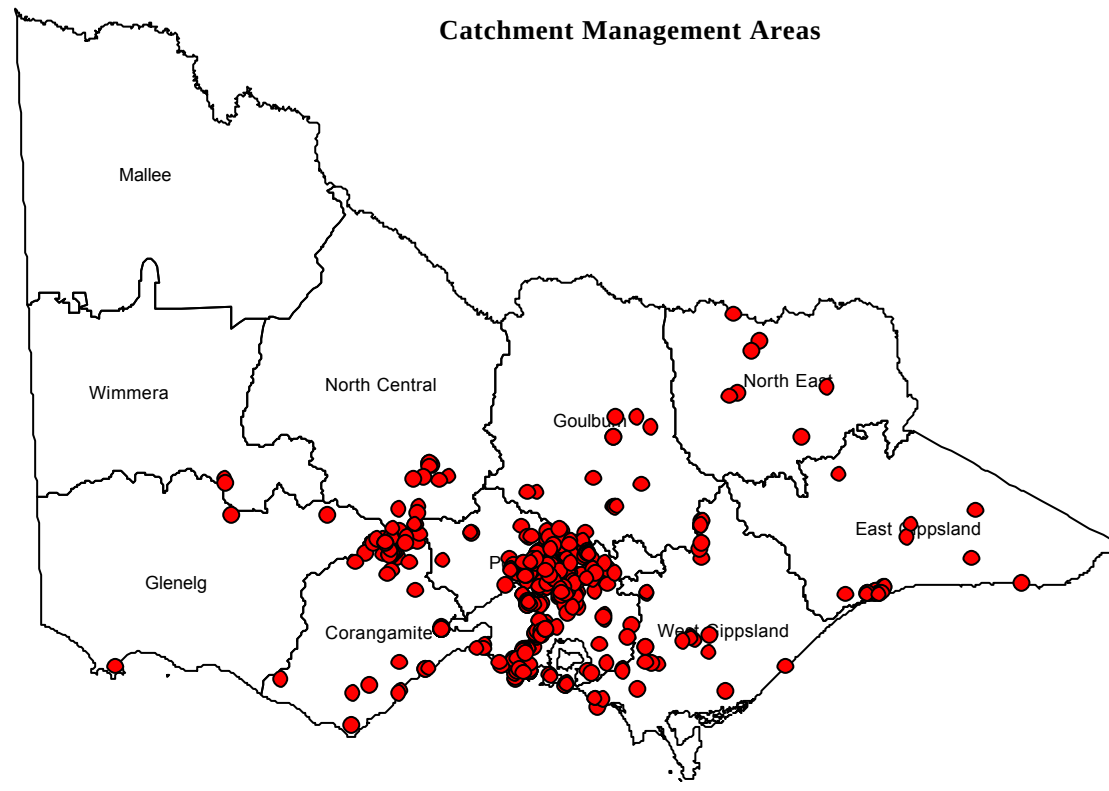
Revisions

Date	Revised by	Revision

Present distribution of *Hedera helix* in Victoria.

Species: *Hedera helix* L.
Common name: English ivy
Status: Not declared noxious in Victoria.
Habitat:

A widely planted ornamental that predominantly occurs in cooler districts where annual rainfall exceeds 700 mm (Muyt 2001). Plants establish in seasonally moist, shaded or sunny positions, and are extremely tolerant of deep shade (Muyt 2001). English ivy is a weed of gardens, roadsides and pine plantations (Blood 2001). English ivy invades dry sclerophyll forest and woodland, damp sclerophyll forest, wet sclerophyll forest, riparian vegetation, rock outcrop vegetation, and warm temperate rainforest (Carr *et al* 1992).



Potential distribution of *Hedera helix* in Victoria.

Species: *Hedera helix* L.
Common name: English ivy
Status: Not declared noxious in Victoria.
Habitat:

A widely planted ornamental that predominantly occurs in cooler districts where annual rainfall exceeds 700 mm (Muyt 2001). Plants establish in seasonally moist, shaded or sunny positions, and are extremely tolerant of deep shade (Muyt 2001). English ivy is a weed of gardens, roadsides and pine plantations (Blood 2001). English ivy invades dry sclerophyll forest and woodland, damp sclerophyll forest, wet sclerophyll forest, riparian vegetation, rock outcrop vegetation, and warm temperate rainforest (Carr *et al* 1992).

Potential distribution produced from CLIMATE modelling and overlayed on suitable overlays with CMA boundaries.

Overlays used.

Land use:

Forestry private and public

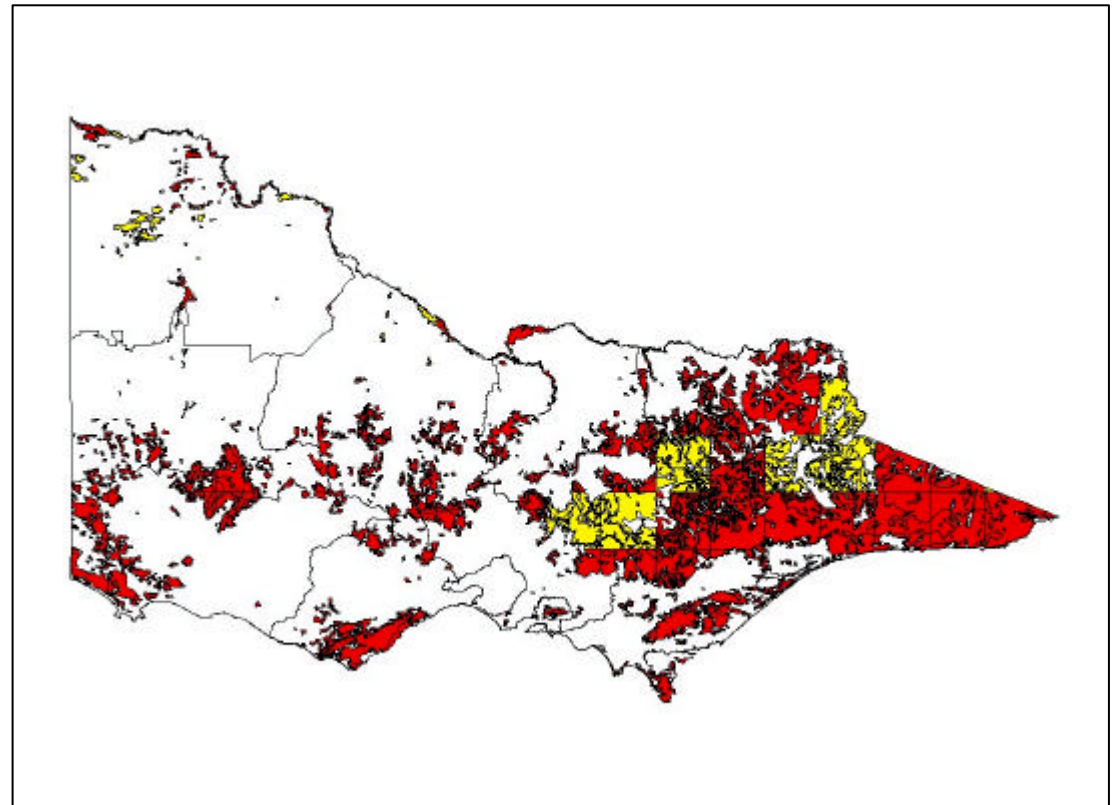
Broad vegetation types:

Dry foothill forest; moist foothill forest; montane moist forest; sub-alpine woodland; plains grassy woodland; valley grassy forest; coastal grassy woodland; herb-rich woodland; montane grassy woodland; riverine grassy woodland; riparian forest; rainshadow woodland; boinka-raak; mallee woodland; heathy woodland; lowland forest; swamp scrub; box-ironbark forest; and inland slopes.

Colours indicate possibility of *Hedera helix* infesting these areas.

Red	= Very high	Yellow	= High
Orange	= Medium	Green	= Likely

In the non-coloured areas the plant is unlikely to establish as the climate, soil or landuse is not presently suitable.



Impact Assessment Record

Scientific Name: Hedera helix

Common name: English ivy

QUESTION	COMMENTS	RATING	CONFIDENCE
Social			
1. Restrict human access?	Vines climb over trees and replace ground cover (Muyt 2001). Presence of weed would not restrict human access.	L	MH
2. Reduce tourism?	In Victoria, it has invaded dry and wet sclerophyll forests, woodlands, riparian vegetation, rocky outcrops and warm temperate rainforest (DEH 2004). May have a minor effect on aesthetics of an area.	ML	M
3. Injurious to people?	‘Compounds in English ivy are somewhat toxic and include glycosides that cause vomiting, diarrhea, nervous conditions and dermatitis in sensitive individuals’ (PCA 2005). Can result in skin rash, dermatitis in some people (Schmidt 2005). Poisoning has been reported in a child (Metcalf 2005), although unlikely to be ingested.	MH	H
4. Damage to cultural sites?	Vines climb over trees and replace ground cover (Muyt 2001). Presence of weed may have moderate visual effect on cultural sites.	ML	MH
Abiotic			
5. Impact flow?	Terrestrial species (Muyt 2001).	L	MH
6. Impact water quality?	Terrestrial species (Muyt 2001).	L	MH
7. Increase soil erosion?	‘Rooting is prolific on all stems and the extensive rootlets on trailing stems can dry the soil surface around them’ (Muyt 2001). Evergreen plant so highly unlikely to contribute to large scale soil movement.	L	MH
8. Reduce biomass?	‘Vines climb as high as they can be supported and, with their heavy weight and vigour, smother and collapse overstorey plants’ (Muyt 2001). Over time, trees may be replaced by more open community leading to a decrease in biomass.	H	MH
9. Change fire regime?	‘Being evergreen and with a relatively high water content, ivy is slow to burn and will not readily spread fire well ... has been proposed to reduce fire risk in seasonally dry areas’ (Metcalf 2005). Plant has potential to moderately change both frequency and intensity of fire risk.	MH	H
Community Habitat			
10. Impact on composition (a) high value EVC	EVC=Limestone Box Forest (V), CMA= East Gippsland, Bioreg.=East Gippsland Lowlands, CLIMATE=VH. An ‘aggressive invader that threatens all vegetation levels of forested and open areas, growing along the ground as well as into the forest canopy’ (PCA, 2005). Displaces all species within a layer.	H	MH
(b) medium value EVC	EVC=Riparian Forest (D), CMA= East Gippsland, Bioreg.=East Gippsland Lowlands, CLIMATE=VH. An ‘aggressive invader that threatens all vegetation levels of forested and open areas, growing along the ground as well as into the forest canopy’ (PCA, 2005). Displaces all species within a layer.	H	MH
(c) low value EVC	EVC=Lowland Forest (LC), CMA= East Gippsland, Bioreg.=East Gippsland Lowlands, CLIMATE=VH. An ‘aggressive invader that threatens all vegetation levels of forested and open areas, growing along the ground as well as into the forest canopy’ (PCA, 2005). Displaces all species within a layer.	H	MH

Impact Assessment Record

Scientific Name: Hedera helix

Common name: English ivy

QUESTION	COMMENTS	RATING	CONFIDENCE
11. Impact on structure?	An 'aggressive invader that threatens all vegetation levels of forested and open areas, growing along the ground as well as into the forest canopy' (PCA 2005). Major effects on all layers.	H	MH
12. Effect on threatened flora?	This species is not documented as posing an additional risk to threatened flora.	MH	L
Fauna			
13. Effect on threatened fauna?	This species is not documented as posing an additional risk to threatened fauna.	MH	L
14. Effect on non-threatened fauna?	No documented evidence to suggest weed effects non-threatened fauna species.	L	MH
15. Benefits fauna?	Weed not known to provide benefits to indigenous fauna.	H	MH
16. Injurious to fauna?	Weed not known to be injurious to fauna.	L	MH
Pest Animal			
17. Food source to pests?	Seed is dispersed by birds including English house sparrows, European starlings. (PCA 2005) In England, the typical consumer is the blackbird (ISSG 2005). In Australia, seed dispersed by foxes (Muyt 2001).	MH	MH
18. Provides harbour?	Not known to provide harbour for pest species.	L	MH
Agriculture			
19. Impact yield?	Not a weed of agriculture.	L	MH
20. Impact quality?	Not a weed of agriculture.	L	MH
21. Affect land value?	Weed not known to affect land value.	L	MH
22. Change land use?	Weed not known to cause a change in priority of land use.	L	MH
23. Increase harvest costs?	Not a weed of agriculture.	L	MH
24. Disease host/vector?	Not a known host or vector for disease of agriculture.	L	MH

Impact Assessment Record

Scientific Name: Hedera helix

Common name: English ivy

References cited:

Department of Environment and Heritage 2004, *Potential environmental weeds in Australia*, Department of Environment and Heritage, Canberra, viewed 16 Dec 2005, <http://www.deh.gov.au/biodiversity/invasive/publications/weeds-potential/appendix-c-h.html>

Invasive Species Specialist Group 2005, *Hedera helix* (vine, climber), Global Invasive Species Database, The World Conservation Union, viewed 15 Dec 2005, <http://www.issg.org/database/species/ecology.asp?si=469&fr=1&sts=sss>

Metcalf, D. J. 2005, '*Hedera helix* L.', *Journal of Ecology*, vol. 93, pp. 632-648.

Plant Conservation Alliance 2005, *English ivy: Hedera helix* L., National Park Service, Washington, viewed 15 Dec 2005, <http://www.nps.gov/plants/alien/fact/hehe1.htm>

Schmidt, R.J. 2005, *Araliaceae* (ginseng or aralia or ivy family), Botanical Dermatology Database, viewed 15 Dec 2005, <http://bodd.cf.ac.uk/>

Revisions

Date	Revised by	Revision

Invasiveness Assessment Record

Scientific name: *Hymenachne amplexicaulis*

Common Name: olive hymenachne, hymenachne

QUESTION	COMMENTS	RATING	CONFIDENCE
Establishment			
1. Germination requirements?	Requires alternating periods of flooding and dryness to establish and survive (Weber 2003). It is adapted to fluctuating water levels and massive regeneration by seed may occur after drought. Plants usually flower from April to June but have been observed flowering in September and there's evidence that the plant can flower and set seeds over a longer period of time in unusually wet years (DNRM 2005).	H	MH
2. Establishment requirements?	Sets viable seed after flowering – the seeds germinate on damp bare ground Seeds set from late autumn to early spring (KEC 1991).	ML	M
3. How much disturbance is required?	Occurs in shallow waters of swamp margins and river banks (Weber 2003).	MH	MH
Growth/Competitive			
4. Life form?	A robust perennial grass / semi-aquatic (Wildin 1989).	H	H
5. Allelopathic properties?	None described in consulted references.	L	MH
6. Tolerates herb pressure?	It has been established for use in ponded pastures in Central Queensland (Kibbler & Bahnisch 1999). One of the major forages of buffaloes on the flood plains east of Darwin (Wildin 1988).	M	H
7. Normal growth rate?	Is a large species that can grow in deeper water than other species of the same life form giving it the potential to infest wetlands and choke streams (KEC 1991). It has the ability to smother native vegetation and form dense and extensive monospecific stands (IPIF 2005).	H	MH
8. Stress tolerance to frost, drought, w/logg, sal. etc?	Tolerant of drought and flood (Wildin 1988).	MH	H
Reproduction			
9. Reproductive system	Rhizomatous and sets seed (Hill 1996).	H	MH
10. Number of propagules produced?	'Massive regeneration by seed may occur after drought' (Weber 2003). Germination is variable – ranging from 86% to 0%. Factors affecting seed fertility are not clearly understood (Hill 1996). Prolific seed production (greater than 2000/m ²) (IPIF 2005).	H	MH
11. Propagule longevity?	Trial work indicates that in field conditions, the seed viability is still high after more than a year. Not enough information to determine propagule longevity. Therefore score as medium.	M	L
12. Reproductive period?	Species forms self-sustaining dense monocultures (Hill 1996).	H	MH

Invasiveness Assessment Record

Scientific name: *Hymenachne amplexicaulis*

Common Name: olive hymenachne, hymenachne

QUESTION	COMMENTS	RATING	CONFIDENCE
13. Time to reproductive maturity?	Perennial grass (Wildin 1989) – therefore assume maturity within first year	H	H
Dispersal			
14. Number of mechanisms?	Seeds are dispersed by water (Weber 2003). Possibility of natural introduction to Central America via migratory birds (Hill 1996). Migratory aquatic birds (DNRM 2005).	H	MH
15. How far do they disperse?	As dispersed by migratory birds (DNRM 2005)– assume that it's very likely that some propagules will disperse greater than one kilometre.	H	M

References cited:

Department of Natural Resources and Mines, Queensland 2005, Hymenachne: *Hymenachne amplexicaulis*, Department of Natural Resources and Mines, Brisbane, viewed: 24 Oct 2005, <http://www.nrm.qld.gov.au/factsheets/pdf/pest/pp54.pdf>

Hill, K. U. 1996, *Hymenachne amplexicaulis: A review of the literature and summary of work in Florida*, Extension Livestock Agent, Collier County, viewed: 23 December 1999, <http://www.naples.net/~kuh/hymen.htm>

Institute of Pacific Islands Forestry 2005, *Pacific Islands ecosystems at risk*, US Hawaiiin Ecosystems at Risk, Honolulu, viewed: 24 October 2005, <http://www.hear.org/pier/>

Kibbler, H & Bahnisch, L M 1999, 'Physiological adaptations of *Hymenachne amplexicaulis* to flooding', *Australian Journal of Experimental Agriculture*, vol. 39, no. 4, pp. 429-435.

Kowari Editorial Committee 1991, Plant invasions: the incidence of environmental weeds in Australia, Australian National Parks and Wildlife Service, Canberra.

Wildin, J. H. 1989, 'Hymenachne amplexicaulis (Rudge) Nees (hymenachne) cv. Olive', *Australian Journal of Experimental Agriculture*, vol. 29, no. 2, p. 293.

Weber, E. 2003, *Invasive plant species of the world: a reference guide to environmental weeds*, CABI Publishing, Wallingford.

Revisions

Date	Revised by	Revision

Present distribution of *Hymenachne amplexicaulis* in Victoria

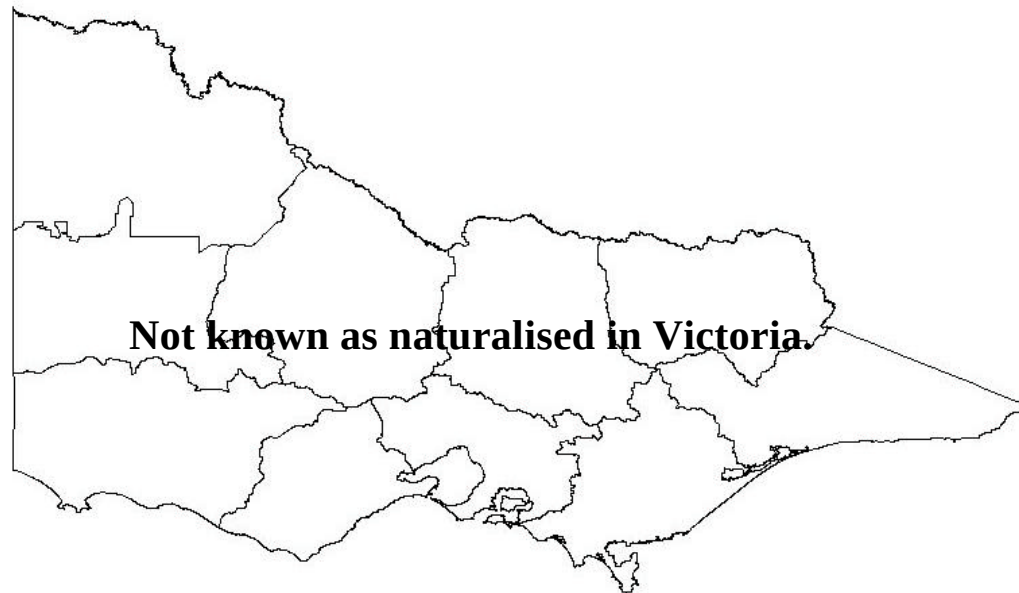
Scientific name: *Hymenachne amplexicaulis* (Rudge) Nees

Common name(s): Hymenachne, olive hymenachne

Status:

Habitat:

Tropical and subtropical regions on dry land or floating in water up to one metre deep (Kowari Editorial Committee 1991). It is a weed of savannas, ponds with predominantly mucky soils, ditches, canal banks and sandy depressional areas (Hill 1996). Hymenachne invades wetlands, swamps and wet areas along rivers and streams (Standley & Steyermark 1958).



Potential distribution of *Hymenachne amplexicaulis* in Victoria

Scientific name: *Hymenachne amplexicaulis* (Rudge) Nees

Common name(s): Hymenachne, olive hymenachne

Status:

Habitat:

Tropical and subtropical regions on dry land or floating in water up to one metre deep (Kowari Editorial Committee 1991). It is a weed of savannas, ponds with predominantly mucky soils, ditches, canal banks and sandy depressional areas (Hill 1996). Hymenachne invades wetlands, swamps and wet areas along rivers and streams (Standley & Steyermark 1958).

Potential distribution produced from CLIMATE modelling refined by applying suitable landuse and vegetation type overlays with CMA boundaries

MAP OVERLAYS USED.

Land Use:

Pasture irrigated and dryland

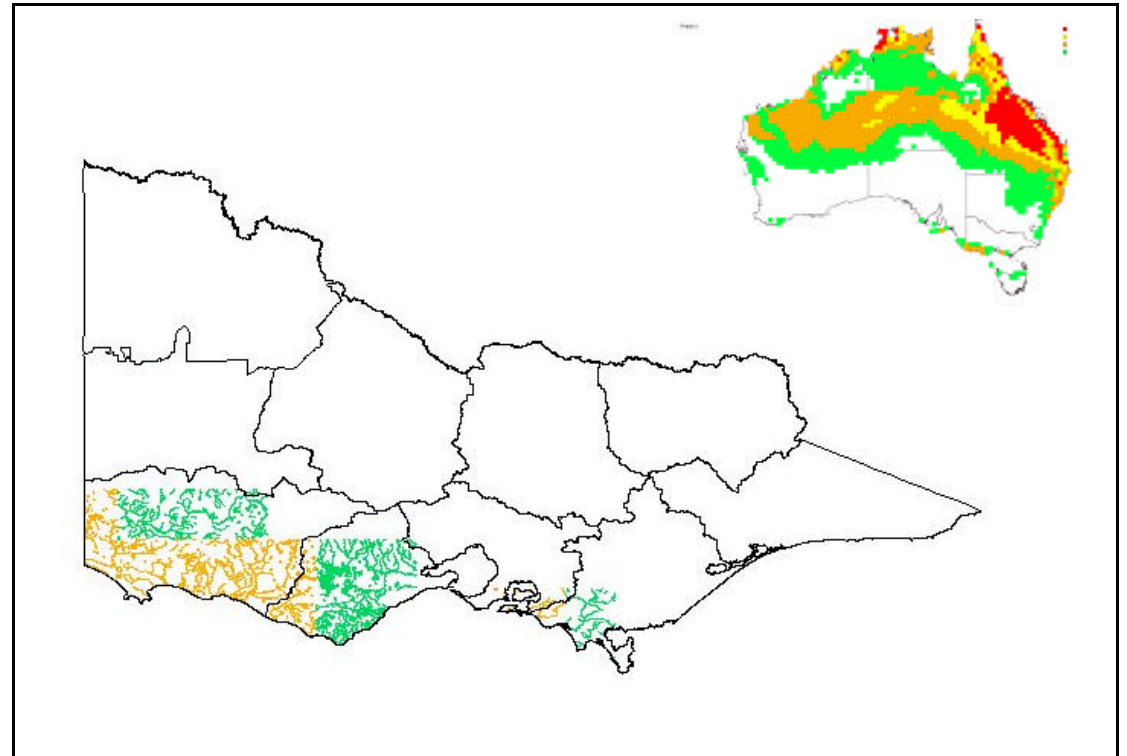
Broad vegetation types

Swamp scrub; sedge-rich woodland; moist foothill forest; grassland; plains grassy woodland; herb-rich woodland; montane grassy woodland; riverine grassy woodland; riparian forest; rainshadow woodland.

Colours indicate possibility of *Hymenachne amplexicaulis* infesting these areas.

 Red	= Very high	 Yellow	= High
 Orange	= Medium	 Green	= Likely

In the non-coloured areas the plant is unlikely to establish as the climate, soil or landuse is not presently suitable.



Impact Assessment Record

Scientific Name: *Hymenachne amplexicaulis*

Common name: hymenachne, olive hymenachne

QUESTION	COMMENTS	RATING	CONFIDENCE
Social			
1. Restrict human access?	Perennial grass to 2.5 metres high. It invades waterways including drains, lagoons, creeks and rivers (Diaz <i>et al</i> 2003). Heavy infestations may be a major impediment to access waterways.	H	MH
2. Reduce tourism?	"Overseas, hymenachne forms floating mats and grass islands" (NRM 2001). Serious impact on water-based recreation.	H	M
3. Injurious to people?	The plant has no physical or toxic properties that may injure humans. However '...the mats that the plants form create a haven for mosquitoes that are vectors of Ross River Fever and encephalitis' (NRM 2001). Therefore score as medium.	M	M
4. Damage to cultural sites?	Plant not likely to cause damage to indigenous or cultural European sites.	L	MH
Abiotic			
5. Impact flow?	"Hymenachne can choke drains and small watercourses, increasing flooding by reducing the flow capacity of the drainage networks" (Diaz <i>et al</i> 2003). Major impact on either surface or sub-surface flow.	MH	MH
6. Impact water quality?	"Heavy infestations reduce the infiltration of sunlight...[and] prevents the exchange of air, which normally occurs on an open water surface. As plant material decomposes it uses oxygen causing water pollution and stagnation" (Diaz <i>et al</i> 2003). High effects in dissolved O ₂ .	H	MH
7. Increase soil erosion?	"Hymenachne can choke drains and small watercourses, increasing flooding" (Diaz <i>et al</i> 2003). High potential for erosion with offsite implications	MH	MH
8. Reduce biomass?	Density of infestations suggests biomass would significantly increase. (Cruz & Salazar 1989). In aquatic situations, increase in biomass is a negative attribute.	H	H
9. Change fire regime?	Occurs in wetland situations (NRM 2001). Unlikely to contribute to fire risk.	L	MH
Community Habitat			
10. Impact on composition (a) high value EVC	EVC=Swamp scrub (E); CMA=Corangamite; Bioregion=Victorian Volcanic Plain; CLIMATE=M. "Hymenachne can form pure stands that replace native wetland plants." High CLIMATE potential would restrict impact. Unlikely to establish as monoculture, but would still significantly displace grass species.	MH	MH
(b) medium value EVC	EVC=Damp heathland (D); CMA=Glenelg Hopkins; Bioregion=Glenelg Plain; CLIMATE=M.	MH	MH
(c) low value EVC	EVC=Wet heathland (LC); CMA=Glenelg Hopkins; Bioregion=Victorian Volcanic Plain; CLIMATE=M. Impact as in 10(a) above.	MH	MH
11. Impact on structure?	"Hymenachne can form pure stands that replace native wetland plants" (ARMCANZ 2000)	H	MH
12. Effect on threatened flora?	This species is not documented as posing an additional risk to threatened flora in Victoria.	MH	L

Impact Assessment Record

Scientific Name: *Hymenachne amplexicaulis*

Common name: hymenachne, olive hymenachne

QUESTION	COMMENTS	RATING	CONFIDENCE
Fauna			
13. Effect on threatened fauna?	This species is not documented as posing an additional risk to threatened fauna in Victoria	MH	L
14. Effect on non-threatened fauna?	"A large infestation of hymenachne is a physical barrier for aquatic and semi-aquatic animals, restricting their territorial movements and breeding activities" (NRM 2001). Can 'reduce resources available for feeding, breeding and shelter of native fauna' (Diaz <i>et al</i> 2003). Reduction in habitat for fauna.	MH	MH
15. Benefits fauna?	No known benefits to native fauna.	H	MH
16. Injurious to fauna?	Not known to be harmful to fauna. It was grown in Queensland for a high-quality ponded pasture grass (NRM 2001) and in Florida (Hill 1996).	L	MH
Pest Animal			
17. Food source to pests?	Not known as a food source to pest animals.	L	MH
18. Provides harbor?	Not known to provide harbor for pest animals.	L	MH
Agriculture			
19. Impact yield?	Originally grown in Queensland for a high-quality ponded pasture grass, the species would have no negative impact on yield in grazing situations. It may restrict access to watering points, and its capacity to occur in irrigation channels may impact on the yield of irrigated crops (NRM 2001). However, there is no data to support the level of impact.	M	L
20. Impact quality?	No data on effect on quality of produce.	M	L
21. Affect land value?	No data available to determine impact on land value.	M	L
22. Change land use?	No data available to suggest change in land use.	M	L
23. Increase harvest costs?	Does not affect harvesting activities.	L	MH
24. Disease host/vector?	None described	L	MH

References cited:

Agriculture and Resource Management Council of Australia & New Zealand, Australian & New Zealand Environment & Conservation Council and Forestry Ministers 2000, *Weeds of National Significance Hymenachne (Hymenachne amplexicaulis) Strategic Plan*. National Weeds Strategy Executive Committee, Launceston.

Cruz, V. and Salazar, P. 1989, 'Biomass and primary production of the periphyton in a flooded savanna of Venezuela', *Revue-d Hydrobiologie – Tropicale*, vol. 22, no. 3, pp. 213-222, CAB abstracts

Impact Assessment Record

Scientific Name: *Hymenachne amplexicaulis*

Common name: hymenachne, olive hymenachne

Department of Natural Resources and Mines, State of Queensland. 2001, *Hymenachne*, *Hymenachne amplexicaulis*. (PP54). Available:

<http://www.nrm.qld.gov.au/factsheets/pdf/pest/PP54.pdf> Accessed 08/07/03.

Diaz, R., Overholt, W.A. & Cuda, J.P. 2003, Exotics in the wetlands: West Indian marsh grass, Institute of Food and Agricultural Sciences, University of Florida, viewed 17 Mar 2006, <http://edis.ifas.ufl.edu/pdf/IN/IN49100.pdf>

Hill, K.U. 1996, *Hymenachne amplexicaulis : A review of the literature and summary of work in Florida*, University of Florida, viewed 02 Feb 2006, <http://www.naples.net/~kuh/hymen.htm>

Revisions

Date	Revised by	Revision

Invasiveness Assessment Record

Scientific name: *Hypericum calycinum*

Common Name: large flowered St John's wort, rose-of-Sharon

QUESTION	COMMENTS	RATING	CONFIDENCE
Establishment			
1. Germination requirements?	'Germination usually takes place .. at 10°C' (PFAF n.d.). Requires seasonal temperatures.	MH	M
2. Establishment requirements?	'It can grow in full shade (deep woodland) semi-shade (light woodland) or no shade' but flowers better in sun (PFAF n.d.). Can establish without additional factors.	H	M
3. How much disturbance is required?	Can be found in grassland, forest edges, disturbed sites (Weber 2003). Can establish in relatively intact natural ecosystems.	MH	MH
Growth/Competitive			
4. Life form?	Small shrub (Weber 2003). Life form – other.	L	MH
5. Allelopathic properties?	None described in Weber (2003).	L	MH
6. Tolerates herb pressure?	In California, the chrysomelid beetle, <i>Chrysolina quadrigemina</i> , was found to attack <i>H. calycinum</i> (Van Klinken & Edwards 2002). In ' <i>H. calycinum</i> , the same chemical not only attracts pollinating insects but also deters herbivores that pose a threat to its survival' (Gronquist <i>et al</i> 2001). Score as medium high as is consumed in California but generally not eaten by animals or insects.	MH	H
7. Normal growth rate?	Grows 'at a fast rate' (PFAF n.d.). Assume that growth will equal competitive species of same life form.	MH	M
8. Stress tolerance to frost, drought, w/logg, sal. etc?	'A drought-resistant and fire-tolerant species' (Weber 2003). Can grow in sandy soils (PFAF n.d.). 'A very cold-hardy plant, tolerating temperatures down to about -25°C (PFAF n.d.). Not documented as to whether plant can withstand waterlogging.	MH	MH
Reproduction			
9. Reproductive system	Has rhizomes (Weber 2003). Both cross and self-pollinated (PFAF n.d.). Both vegetative and sexual reproduction.	H	MH
10. Number of propagules produced?	Propagules produced per flowering event not documented. Spreads more through rhizomes. Has 'extensively creeping rhizomes' (Weber 2003). Score as medium.	M	MH
11. Propagule longevity?	Mainly reproduces vegetatively. No documented information on seed viability. Score as low.	L	L
12. Reproductive period?	'.. forms dense colonies due to the extensively creeping rhizomes' (Weber 2003). Capable of forming dense monocultures.	H	MH
13. Time to reproductive maturity?	Time to reproductive maturity is not documented. Score as medium.	M	L
Dispersal			
14. Number of mechanisms?	No evidence of how propagules are spread. Mainly spread by gravity.	L	L

Invasiveness Assessment Record

Scientific name: *Hypericum calycinum*

Common Name: large flowered St John's wort, rose-of-Sharon

QUESTION	COMMENTS	RATING	CONFIDENCE
15. How far do they disperse?	Unlikely that propagules will disperse greater than 200m.	L	L

References cited:

Gronquist, M., Bezzerides, A., Attygalle, A., Meinwald, J., Eisner, M. & Eisner, T. 2001, 'Attractive and defensive functions of the ultraviolet pigments of a flower (*Hypericum calycinum*), *Proceedings of the National Academy of Sciences of the United States of America*, vol. 98, no. 24, pp. 13745-13750, viewed 09 Jan 2006, <http://www.pnas.org/cgi/content/full/98/24/13745>

Plants for a Future n.d., *Hypericum calycinum*, Plants for a Future Database, viewed 09 Jan 2006, http://www.ibiblio.org/pfaf/cgi-bin/arr_html?Hypericum+calycinum&CAN=LATIND

Van Klinken, R.D. & Edwards, O.R. 2002, 'Is host specificity of weed biological control agents likely to evolve rapidly following establishment?', *Ecology Letters*, vol. 5, pp. 590-596.

Weber, E. 2003, *Invasive plant species of the world: a reference guide to environmental weeds*, CABI Publishing, Wallingford.

Revisions

Date	Revised by	Revision

Present distribution of *Hypericum calycinum* in Victoria

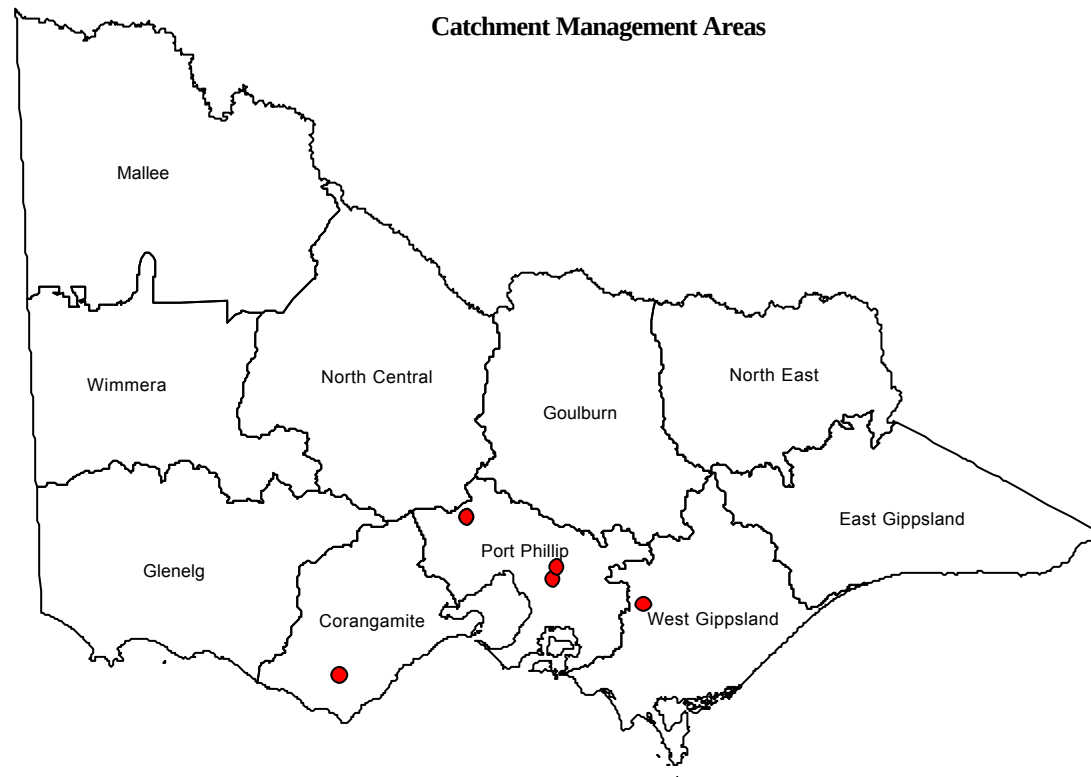
Scientific name: *Hypericum calycinum* L.

Common name(s): large flowered St John's wort, rose-of-Sharon

Status:

Habitat:

Grassland, forest edges, disturbed sites (Weber 2003). Grassy places and open woods to 1800 metres. (PFAF n.d.) . Found in Milford in new Zealand in sites highly disturbed by humans (Johnson 1982).



Potential distribution of *Hypericum calycinum* in Victoria

Scientific name: *Hypericum calycinum* L.

Common name(s): large flowered St John's wort, rose-of-Sharon

Status:

Habitat:

Grassland, forest edges, disturbed sites (Weber 2003). Grassy places and open woods to 1800 metres. (PFAF n.d.) . Found in Milford in new Zealand in sites highly disturbed by humans (Johnson 1982).

Potential distribution produced from CLIMATE modelling refined by applying suitable landuse and vegetation type overlays with CMA boundaries

MAP OVERLAYS USED.

Land Use:

Pasture dryland

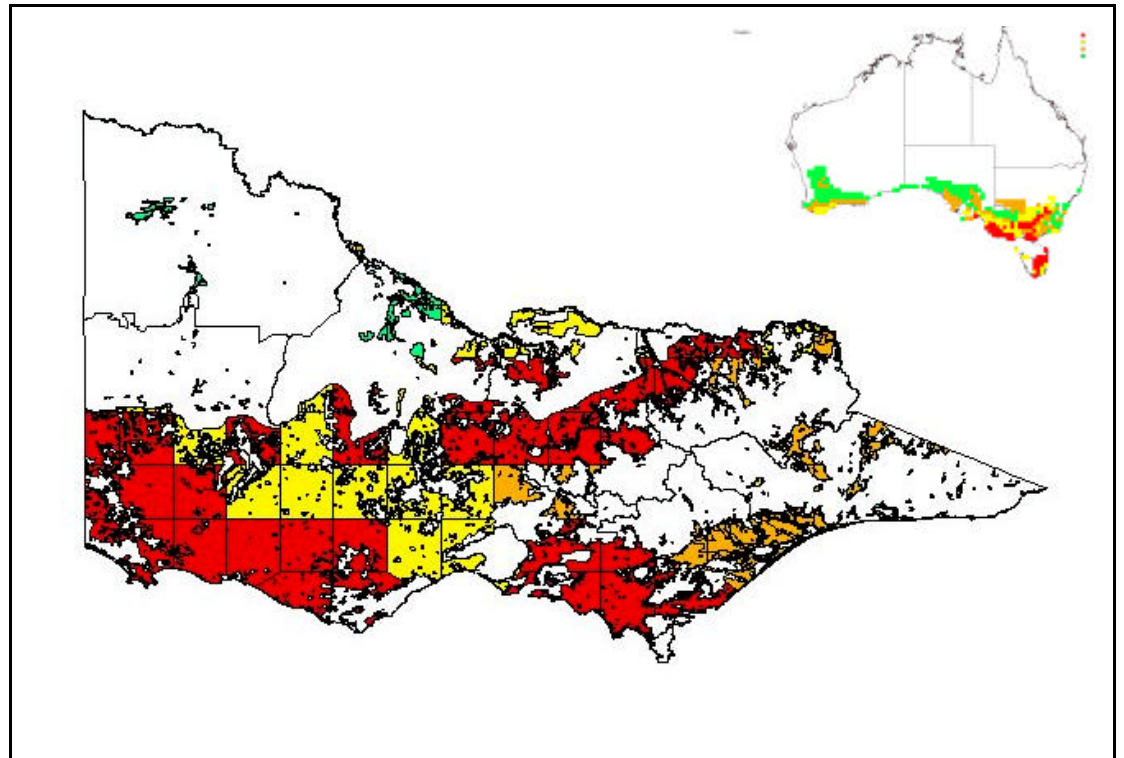
Broad vegetation types

Coastal scrubs and grassland; Coastal grassy woodland; grassland; plains grassy woodland; herb-rich woodland

Colours indicate possibility of *Hypericum calycinum* infesting these areas.

 Red	= Very high	 Yellow	= High
 Orange	= Medium	 Green	= Likely

In the non-coloured areas the plant is unlikely to establish as the climate, soil or landuse is not presently suitable.



Impact Assessment Record

Scientific Name: *Hypericum calycinum*

Common name: large flowered St John's wort, rose-of-Sharon

QUESTION	COMMENTS	RATING	CONFIDENCE
Social			
1. Restrict human access?	Shrub which can grow up to 60cm tall (Weber 2003). Can grow up to one metre wide and dense (PFAF n.d.). Unlikely that the weed would restrict human access.	L	MH
2. Reduce tourism?	Bright yellow flowers up to 8cm in diameter (Weber 2003). 'its large golden fls with pink anthers are very conspicuous' (Webb <i>et al</i> 1988). Tourists may be aware of weed but not bothered or activity inhibited.	ML	H
3. Injurious to people?	Plant not known to be injurious or toxic.	L	MH
4. Damage to cultural sites?	'.. its large golden fls with pink anthers are very conspicuous' (Webb <i>et al</i> 1988). Would have a moderate visual effect.	ML	H
Abiotic			
5. Impact flow?	Terrestrial species (Weber 2003).	L	MH
6. Impact water quality?	Terrestrial species (Weber 2003).	L	MH
7. Increase soil erosion?	Root system is fast spreading and stoloniferous. Unlikely that the plant would contribute to large scale soil erosion.	L	MH
8. Reduce biomass?	'It impedes the growth and regeneration of native shrubs and trees by competing for nutrients and space' (Weber 2003). Can be found in grassland, forest edges, disturbed sites (Weber 2003). In some situations, biomass may slightly decrease if plant outcompetes other trees and shrubs.	MH	MH
9. Change fire regime?	Evergreen plant. Weed would have a small or negligible effect on fire risk.	L	MH
Community Habitat			
10. Impact on composition (a) high value EVC	EVC=Plains Grassy Woodland (E); CMA=Corangamite; Bioreg=Volcanic Plains; CLIMATE potential=VH. 'It impedes the growth and regeneration of native shrubs and trees by competing for nutrients and space' (Weber 2003). '.. forms dense colonies due to the extensively creeping rhizomes' (Weber 2003). Displaces all species within a layer.	H	MH
(b) medium value EVC	Grassy Dry Forest (D); CMA=Corangamite; Bioreg=Volcanic Plains; CLIMATE potential=VH. 'It impedes the growth and regeneration of native shrubs and trees by competing for nutrients and space' (Weber 2003). '.. forms dense colonies due to the extensively creeping rhizomes' (Weber 2003). Displaces all species within a layer.	H	MH
(c) low value EVC	EVC= Coastal Tussock Grassland (LC); CMA=Port Phillip; Bioreg=Gippsland Plain; CLIMATE potential=VH. 'It impedes the growth and regeneration of native shrubs and trees by competing for nutrients and space' (Weber 2003). '.. forms dense colonies due to the extensively creeping rhizomes' (Weber 2003). Displaces	H	MH

Impact Assessment Record

Scientific Name: *Hypericum calycinum*

Common name: large flowered St John's wort, rose-of-Sharon

QUESTION	COMMENTS	RATING	CONFIDENCE
	all species within a layer.		
11. Impact on structure?	'It impedes the growth and regeneration of native shrubs and trees by competing for nutrients and space' (Weber 2003). '.. forms dense colonies due to the extensively creeping rhizomes' (Weber 2003). Major effect on all layers.	H	MH
12. Effect on threatened flora?	This species is not documented as posing an additional risk to threatened flora.	MH	L
Fauna			
13. Effect on threatened fauna?	This species is not documented as posing an additional risk to threatened fauna.	MH	L
14. Effect on non-threatened fauna?	Weed not documented to have an effect on non-threatened fauna species.	L	MH
15. Benefits fauna?	Weed not known to provide support to desirable species.	H	MH
16. Injurious to fauna?	Weed is not toxic and has no spines or burrs.	L	MH
Pest Animal			
17. Food source to pests?	Not known as a food source to pests.	L	MH
18. Provides harbor?	Not known to provide harbour to pest animals.	L	MH
Agriculture			
19. Impact yield?	Not listed as a weed of agriculture.	L	MH
20. Impact quality?	Not listed as a weed of agriculture.	L	MH
21. Affect land value?	Weed not known to affect land value.	L	MH
22. Change land use?	Weed not known to cause a change in priority of land use.	L	MH
23. Increase harvest costs?	Not listed as a weed of agriculture.	L	MH
24. Disease host/vector?	Not known as an alternative host or vector for diseases of agriculture.	L	MH

Impact Assessment Record

Scientific Name: *Hypericum calycinum*

Common name: large flowered St John's wort, rose-of-Sharon

References cited:

Plants for a Future n.d., *Hypericum calycinum*, Plants for a Future Database, viewed 09 Jan 2006, http://www.ibiblio.org/pfaf/cgi-bin/arr_html?Hypericum+calycinum&CAN=LATIND

Webb, C.J., Sykes, W.R. & Garnock-Jones, P.J. 1988, *Flora of New Zealand: volume 4: naturalised pteridophytes, gymnosperms, dicotyledons*, Department of Scientific and Industrial Research, Christchurch.

Weber, E. 2003, *Invasive plant species of the world: a reference guide to environmental weeds*, CABI Publishing, Wallingford.

Revisions

Date	Revised by	Revision

Invasiveness Assessment Record

Scientific name: *Hypericum canariense*

Common Name: Canary Is. St John's Wort

QUESTION	COMMENTS	RATING	CONFIDENCE
Establishment			
1. Germination requirements?	'Water is sufficient to break seed dormancy' (Dlugosch 2004). Opportunistic germinator.	H	MH
2. Establishment requirements?	'It seems to invade only disturbed or dry sites that have sufficient light' (PIER 2005). Requires more specific requirements to establish.	ML	MH
3. How much disturbance is required?	In Hawaii found 'along roads, in yards, gulches, and pastures' (Starr et al 2003). On Canary Islands it is found in dry scrub and laurel forests (Dlugosch 2004). Also found in coastal sage scrub and in grassland habitats (PIER 2005). Can establish in minor disturbed natural ecosystem.	MH	MH
Growth/Competitive			
4. Life form?	Shrub (Randall 2002). Life form – other.	L	H
5. Allelopathic properties?	None described (PIER 2005).	L	MH
6. Tolerates herb pressure?	In Maui numerous insects were observed to be associated with <i>H. canariense</i> however 'none of these insects were doing much damage to the plants' (Starr et al 2003). Consumed but recovers quickly.	MH	MH
7. Normal growth rate?	'Given favourable conditions, it may grow to over 1m in its first year' (Dlugosch 2004). In California it does outcompete dominant native shrubs (Randall 2002). Rapid growth rate that will exceed most other species of same life form.	H	H
8. Stress tolerance to frost, drought, w/logg, sal. etc?	Found in xerophytic scrub (PIER 2005). Somewhat tolerant to drought. In its native range in Canary Islands, not subjected to frost. Occurs in places with salinity (Hansford & Iaconis 2004). No evidence to suggest that plant is tolerant of fire or waterlogging.	ML	H
Reproduction			
9. Reproductive system	Reproduces by both seeds and rhizomes (Hansford & Iaconis 2004). Both vegetative and sexual reproduction.	H	H
10. Number of propagules produced?	Seeds are numerous (Randall 2002). Each fruit 'releases hundreds of tiny seeds' (Dlugosch 2004). Produces greater than 2000 seeds per flowering event.	H	H
11. Propagule longevity?	'.. seed germination rate is approximately 50%' (Dlugosch 2004). Longevity not documented but no evidence to suggest seed survival is greater than 5 years.	L	MH
12. Reproductive period?	'Left undisturbed it is very likely to develop dense monoculture infestations' (Randall 2002).	H	H
13. Time to reproductive maturity?	'Flowers and fruits may be produced in the first year of growth' (Dlugosch 2004).	H	MH
Dispersal			
14. Number of mechanisms?	'[<i>H. canariense</i>] light seeds are probably wind dispersed'. Plants are found along roads, which may be an indication that it is spread by light vehicular traffic. (Starr et al 2003).	MH	MH

Invasiveness Assessment Record

Scientific name: *Hypericum canariense*

Common Name: Canary Is. St John's Wort

QUESTION	COMMENTS	RATING	CONFIDENCE
15. How far do they disperse?	'Local spread in California ranges from 45 to 90 metres a year, which is considerable distance for a perennial shrub with no outside assistance or any known dispersal mechanisms' (Randall 2002). Very few to none will disperse to 1km, most 20-200m.	ML	H

References cited:

Dlugosch, K. 2004, *Hypericum canariense* (Canary Island St Johnswort), University of California, Santa Cruz, viewed 10 Jan 2006, <http://bio.research.ucsc.edu/people/parker/hypericum/>

Hansford, M. & Iaconis, L.J. 2004, 'Early intervention action on Canary Island St. John's wort, *Hypericum canariense* L. in Victoria', In: B.M. Sindel & S. B. Johnson eds, , in *Fourteenth Australian Weeds Conference*, 6-9 September, Wagga Wagga, Rg. & F.J. Richardson, Melbourne, pp. 469 – 471.

Pacific Island Ecosystems at Risk, 2005, *Hypericum canariense* risk assessment, Pacific Island Ecosystems at Risk, Hawaii Ecosystems at Risk Project, viewed 10 Jan 2006, http://www.hear.org/pier/wra/pacific/hypericum_canariense_htmlwra.htm

Randall, R. 2002, 'Weed potential of Canary Islands St. John's wort, *Hypericum canariense* L. (Clusiaceae)', *Weed Science*,

Starr, F., Starr, K. & Loope, L. 2003, *Hypericum canariense*: Canary Islands St Johnswort, Clusiaceae, Plants of Hawaii, Hawaii Ecosystems at Risk Project, viewed 11 Jan 2006, http://www.hear.org/starr/hiplants/reports/html/hypericum_canariense.htm

Revisions

Date	Revised by	Revision

Present distribution of *Hypericum canariense* in Victoria

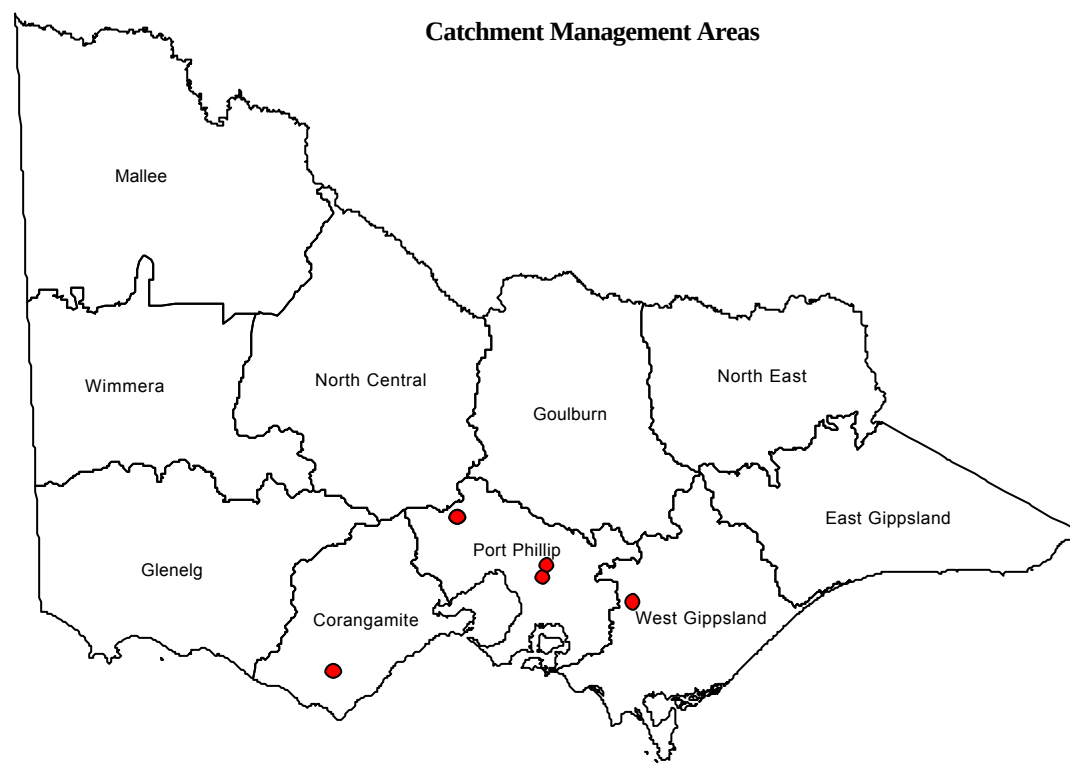
Scientific name: *Hypericum canariense* L.

Common name(s): Canary Island St Johns wort

Status:

Habitat:

In its native range it has been found growing in the wild in disturbed places, coastal sage scrub, and in xerophytic scrub or forested zones from 150 to 800 metres. In grassland habitats up to 100 metres in elevation in coastal areas of California (PIER 2005). Natural areas threatened by *H. canariense* include mid to high elevation shrubland, grassland, gulches, and mesic to xeric forests (Starr *et al* 2003)



Potential distribution of *Hypericum canariense* in Victoria

Scientific name: *Hypericum canariense* L.

Common name(s): Canary Island St Johns wort

Status:

Habitat:

In its native range it has been found growing in the wild in disturbed places, coastal sage scrub, and in xerophytic scrub or forested zones from 150 to 800 metres. In grassland habitats up to 100 metres in elevation in coastal areas of California (PIER 2005). Natural areas threatened by *H. canariense* include mid to high elevation shrubland, grassland, gulches, and mesic to xeric forests (Starr *et al* 2003)

Potential distribution produced from CLIMATE modelling refined by applying suitable landuse and vegetation type overlays with CMA boundaries

MAP OVERLAYS USED.

Land Use:

Pasture dryland
Pasture irrigation

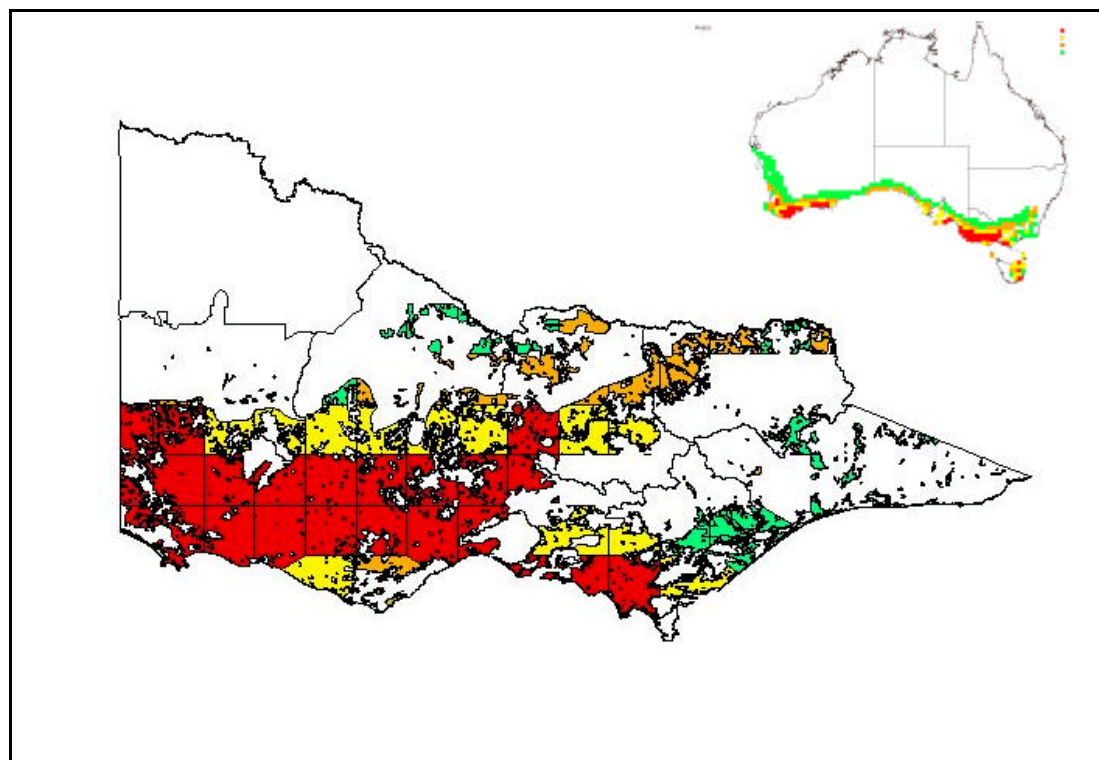
Broad vegetation types

Coastal scrubs and grassland; Coastal grassy woodland; Grassland;
Plains grassy woodland

Colours indicate possibility of *Hypericum canariense* infesting these areas.

Red	= Very high	Yellow	= High
Orange	= Medium	Green	= Likely

In the non-coloured areas the plant is unlikely to establish as the climate, soil or landuse is not presently suitable.



Impact Assessment Record

Scientific Name: *Hypericum canariense*

Common name: Canary Is. St John's Wort

QUESTION	COMMENTS	RATING	CONFIDENCE
Social			
1. Restrict human access?	Many-branched shrub which can grow from one to 5 metres tall (Randall 2002). Species can be used in borders. Plant is likely to impede individual access.	ML	H
2. Reduce tourism?	Has 'numerous bright yellow flowers and an attractive shrubby habit (Randall 2002). Most noticeable during its flowering period (spring) (Starr et al 2003). Weed would have minor effect on aesthetics.	ML	H
3. Injurious to people?	Weed not documented to be injurious in any way.	L	MH
4. Damage to cultural sites?	Has 'numerous bright yellow flowers and an attractive shrubby habit (Randall 2002). Most noticeable during its flowering period (spring) (Starr et al 2003). Weed would have a moderate visual effect.	ML	H
Abiotic			
5. Impact flow?	Terrestrial species.	L	H
6. Impact water quality?	Terrestrial species.	L	H
7. Increase soil erosion?	Shrub is dense and multi-stemmed. Although foliage drops, unlikely that soil would be exposed for any length of time. Low probability of large scale soil movement.	L	MH
8. Reduce biomass?	'Highly competitive plant which displaces virtually all lower storey species' (Randall 2002). Biomass may increase.	L	H
9. Change fire regime?	Multi-stemmed scrub with foliage dropping in late summer (Dlugosch 2004). 'Dense growth in dry environments, carries few leaves' (PIER 2005). Plant would have minor effect on fire risk.	ML	MH
Community Habitat			
10. Impact on composition (a) high value EVC	EVC= Plains Grassy Woodland (E.); CMA=Glenelg Hopkins; Bioreg=Victorian Volcanic Plain; CLIMATE potential=VH. Major displacement of some dominant species within the lower storey.	MH	H
(b) medium value EVC	EVC= Grassy Woodland (D); CMA=West Gippsland; Bioreg=Highland Southern Fall; CLIMATE potential=VH. Major displacement of some dominant species within the lower storey.	MH	H
(c) low value EVC	EVC= Granitic Hills Woodland (LC); CMA=Goulburn Broken; Bioreg=Northern Inland Slopes; CLIMATE potential=VH. Major displacement of some dominant species within the lower storey.	MH	H
11. Impact on structure?	'Highly competitive plant which displaces virtually all lower storey species' (Randall 2002). Major effect on less than 60% of floral strata.	MH	H
12. Effect on threatened flora?	This species is not documented as posing an additional risk to threatened flora.	MH	L

Impact Assessment Record

Scientific Name: *Hypericum canariense*

Common name: Canary Is. St John's Wort

QUESTION	COMMENTS	RATING	CONFIDENCE
Fauna			
13. Effect on threatened fauna?	This species is not documented as posing an additional risk to threatened fauna.	MH	L
14. Effect on non-threatened fauna?	Plant not documented to have an effect on non-threatened fauna.	L	MH
15. Benefits fauna?	Plant not known to provide benefits to indigenous fauna.	H	MH
16. Injurious to fauna?	Plant doesn't have burrs or spines (PIER 2005) and not known to be toxic.	L	MH
Pest Animal			
17. Food source to pests?	Weed not documented as a food source to pest animals.	L	MH
18. Provides harbor?	Weed not known to provide harbour for pest species.	L	MH
Agriculture			
19. Impact yield?	Not known as a weed of agriculture (Randall 2002).	L	H
20. Impact quality?	Not a weed of cropping (Randall 2002).	L	H
21. Affect land value?	Weed not documented to affect land value. Can be controlled by herbicides (PIER 2005).	L	MH
22. Change land use?	Not documented to cause a change in priority of land use. Can be controlled by herbicides (PIER 2005).	L	MH
23. Increase harvest costs?	Not known as a weed of agriculture (Randall 2002).	L	H
24. Disease host/vector?	Not documented as a host or vector for disease of agriculture.	L	MH

References cited:

Dlugosch, K. 2004, *Hypericum canariense* (Canary Island St Johnswort), University of California, Santa Cruz, viewed 10 Jan 2006, <http://bio.research.ucsc.edu/people/parker/hypericum/>

Hansford, M. & Iaconis, L.J. 2004, 'Early intervention action on Canary Island St. Johns wort, *Hypericum canariense* L. in Victoria', In: B.M. Sindel & S. B. Johnson eds, , in *Fourteenth Australian Weeds Conference*, 6-9 September, Wagga Wagga, R.G. & F.J. Richardson, Melbourne, pp. 469 – 471.

Impact Assessment Record

Scientific Name: *Hypericum canariense*

Common name: Canary Is. St John's Wort

Pacific Island Ecosystems at Risk, 2005, *Hypericum canariense* risk assessment, Pacific Island Ecosystems at Risk, Hawaiian Ecosystems at Risk Project, viewed 10 Jan 2006,
http://www.hear.org/pier/wra/pacific/hypericum_canariense_htmlwra.htm

Randall, R. 2002, 'Weed potential of Canary Islands St. John's wort, *Hypericum canariense* L. (Clusiaceae)', *Weed Science*,

Sarr, F., Sarr, K. & Loope, L. 2003, *Hypericum canariense*: Canary Islands St Johnswort, Clusiaceae, Plants of Hawaii, Hawaiian Ecosystems at Risk Project, viewed 11 Jan 2006,
http://www.hear.org/sarr/hiplants/reports/html/hypericum_canariense.htm

Revisions

Date	Revised by	Revision

Invasiveness Assessment Record

Scientific name: *Hypericum humifusum*

Common Name: trailing St. John's wort

QUESTION	COMMENTS	RATING	CONFIDENCE
Establishment			
1. Germination requirements?	Insufficient documented evidence to determine germination / propagule requirements. Score medium.	M	L
2. Establishment requirements?	Found in open habitats (Tutin <i>et al</i> 1968). Locations where weed is found would indicate that it cannot establish under canopy.	ML	H
3. How much disturbance is required?	Found on hedgebanks and in coastal grassland. In Guernsey it is 'common inland and on the cliffs, alongside the paths and on bareish rocky slopes in more accessible areas' (La Societe Guernesiaise 2005). Widespread on heaths and moors. Establishes in minor disturbed natural ecosystems.	MH	MH
Growth/Competitive			
4. Life form?	Glabrous perennial herb (Tutin <i>et al</i> 1968). Life form – other.	L	H
5. Allelopathic properties?	None described. In sufficient documentation on weed. Score a s medium.	M	L
6. Tolerates herb pressure?	Not enough documented evidence to determine ability to tolerate herbivory pressure. Score medium.	M	L
7. Normal growth rate?	Not enough documented evidence to determine normal growth rate of weed. Score medium.	M	L
8. Stress tolerance to frost, drought, w/logg, sal. etc?	Found in S. Sweden, S. Romania and N. Albania (Tutin <i>et al</i> 1968). Suggests frost tolerance. Grows in coastal grassland (La Societe Guernesiaise 2005). May be saline tolerant. Insufficient documented evidence to determine tolerance to drought, waterlogging and fire. Score medium.	M	L
Reproduction			
9. Reproductive system	'The perennial plant propagates with underground buds from rhizomes or sometimes from root'. Can be grown as an annual (FNIAR 2001). Plant vegetatively reproduces but not enough information to determine whether sexually reproduces also. Score medium high.	MH	MH
10. Number of propagules produced?	Not enough documented evidence to determine propagules produced per flowering event. Score medium.	M	L
11. Propagule longevity?	No documented evidence on propagule longevity of weed but does vegetatively reproduce (FINIAR 2001).	L	L
12. Reproductive period?	Insufficient documented information on reproductive period of plant. Score medium.	M	L
13. Time to reproductive maturity?	Perennial but annual in crops (FNIAR 2001). Weed can reach maturity and produce viable propagules in under a year.	H	MH
Dispersal			
14. Number of mechanisms?	Insufficient documented information to determine number of dispersal mechanisms. Score medium.	M	L

Invasiveness Assessment Record

Scientific name: *Hypericum humifusum*

Common Name: trailing St. John's wort

QUESTION	COMMENTS	RATING	CONFIDENCE
15. How far do they disperse?	Insufficient documented information to determine dispersal distance. Score medium.	M	L

References cited:

French National Institute for Agricultural Research 2001, *Hypericum humifusum*, L., Hypermedia for Plant Protection, viewed 16 Jan 2006,

http://www.dijon.inra.fr/malherbo/hyppa/hyppa-a/hyphu_ah.htm

La Societe Guernesiale 2005, *Interesting plants of Guernsey: Hypericum humifusum*, La Societe Guernesiale, viewed 16 Jan 2006,

<http://www.guernsey.net/~cdavid/botany/files/hypericum%20humifusum/index.html>

Tutin, T.G., Heywood, V.H., Burges, N.A., Valentine, D.H., Walters, S.M. & Webb, D.A. (eds) 1968, *Flora of Europaea, vol.2, Rosaceae to Umbelliferae*, Cambridge University Press, Cambridge.

Revisions

Date	Revised by	Revision

Present distribution of *Hypericum humifusum* in Victoria

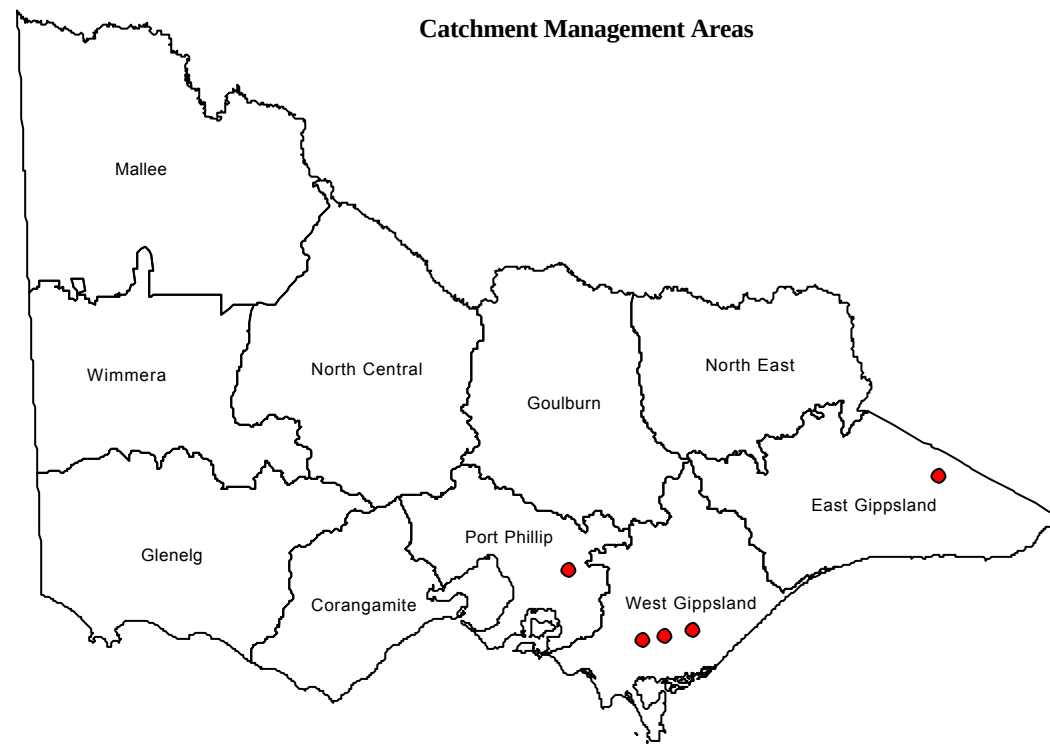
Scientific name: *Hypericum humifusum* L.

Common name(s): trailing St John's wort

Status:

Habitat:

Found in open habitats; usually calcifuge (Tutin *et al* 1968). Widespread on heaths and moors. Found on hedgebanks and in coastal grassland, on cliffs, along paths and on bareish rocky slopes (La Societe Guernesiaise 2005)



Potential distribution of *Hypericum humifusum* in Victoria

Scientific name: *Hypericum humifusum* L.

Common name(s): trailing St John's wort

Status:

Habitat:

Found in open habitats; usually calcifuge (Tutin *et al* 1968). Widespread on heaths and moors. Found on hedgebanks and in coastal grassland, on cliffs, along paths and on bareish rocky slopes (La Societe Guernesiaise 2005)

Potential distribution produced from CLIMATE modelling refined by applying suitable landuse and vegetation type overlays with CMA boundaries

MAP OVERLAYS USED.

Land Use:

Broadacre cropping
Pasture irrigation

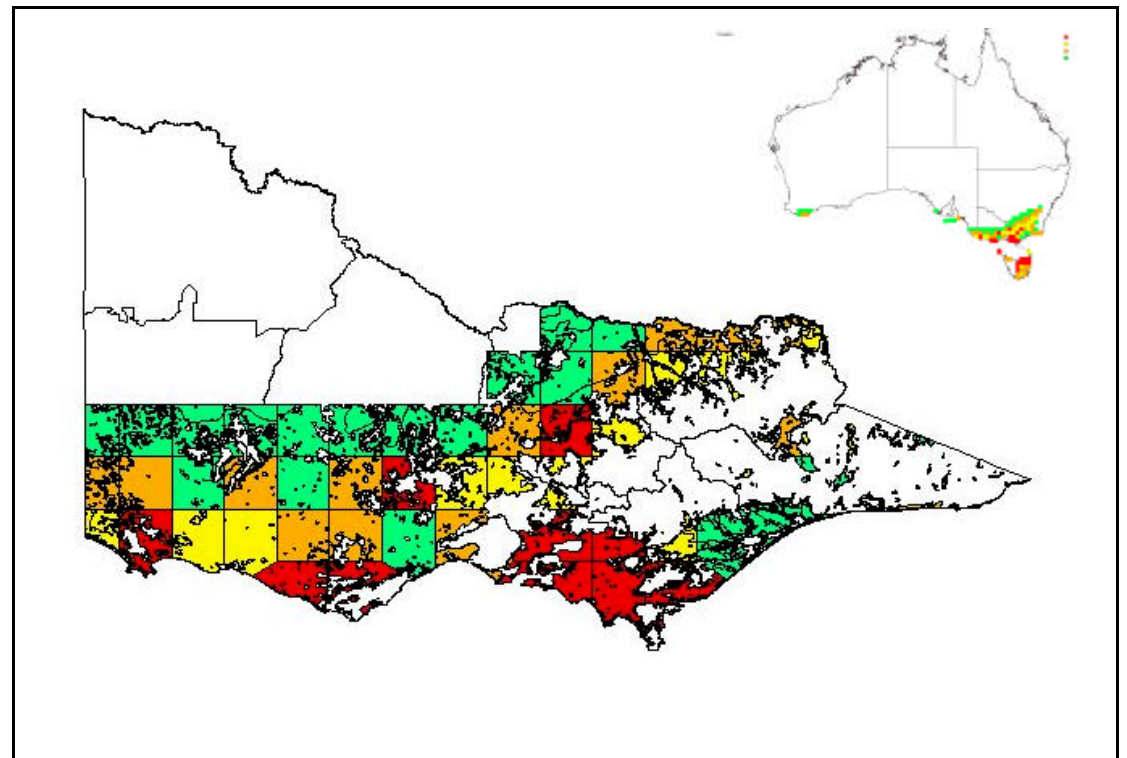
Broad vegetation types

Coastal scrubs and grassland; Coastal grassy woodland; heath;
Inland slopes woodland; Herb-rich woodland; Mallee heath

Colours indicate possibility of *Hypericum humifusum* infesting these areas.

Red	= Very high	Yellow	= High
Orange	= Medium	Green	= Likely

In the non-coloured areas the plant is unlikely to establish as the climate, soil or landuse is not presently suitable.



Impact Assessment Record

Scientific Name: *Hypericum humifusum*

Common name: trailing St. John's wort

QUESTION	COMMENTS	RATING	CONFIDENCE
Social			
1. Restrict human access?	Height is from 3 to 30centimetres (Tutin <i>et al</i> 1968). Plant grows flat along the ground (FNIAR 2001). Plant would have negligible impact on human access.	L	H
2. Reduce tourism?	In Guernsey 'the bright yellow flowers of [<i>H. humifusum</i>] light up [the] banks and cliffs in June and July (La Societe Guernesiaise 2005). Weed may have minor effect on aesthetics.	ML	MH
3. Injurious to people?	No documented evidence that the plant be toxic or injurious to humans.	L	L
4. Damage to cultural sites?	Low lying plant. Little or negligible effect on aesthetics and structure of cultural site.	L	MH
Abiotic			
5. Impact flow?	Terrestrial species.	L	MH
6. Impact water quality?	Terrestrial species.	L	MH
7. Increase soil erosion?	No evidence to suggest that weed would increase soil erosion.	L	MH
8. Reduce biomass?	Found on hedgebanks and in coastal grassland. In Guernsey it is 'common inland and on the cliffs, alongside the paths and on bareish rocky slopes in more accessible areas' (La Societe Guernesiaise 2005). In some situations biomass may increase. However, insufficient information to determine whether or not weed replaces other plants. Score as medium.	M	L
9. Change fire regime?	Glabrous perennial herb (Tutin <i>et al</i> 1968). Weed would have small or negligible effect on fire risk.	L	H
Community Habitat			
10. Impact on composition (a) high value EVC	EVC= Coastal headland scrub (V); CMA=Corangamite; Bioreg=Warrnambool Plain; CLIMATE potential=VH. Found on hedgebanks and in coastal grassland. In Guernsey it is 'common inland and on the cliffs, alongside the paths and on bareish rocky slopes in more accessible areas' (La Societe Guernesiaise 2005). Very little displacement of any indigenous species.	L	MH
(b) medium value EVC	EVC= Clay heathland (D); CMA=West Gippsland; Bioreg=Gippsland Plain; CLIMATE potential=VH. Found on hedgebanks and in coastal grassland. In Guernsey it is 'common inland and on the cliffs, alongside the paths and on bareish rocky slopes in more accessible areas' (La Societe Guernesiaise 2005). Very little displacement of any indigenous species.	L	MH
(c) low value EVC	EVC= Heathy woodland (LC); CMA=West Gippsland; Bioreg=Highland Southern Fall; CLIMATE potential=VH. Found on hedgebanks and in coastal grassland. In Guernsey it is 'common inland and on	L	MH

Impact Assessment Record

Scientific Name: *Hypericum humifusum*

Common name: trailing St. John's wort

QUESTION	COMMENTS	RATING	CONFIDENCE
	the cliffs, alongside the paths and on bareish rocky slopes in more accessible areas' (La Societe Guernesiale 2005). Very little displacement of any indigenous species.		
11. Impact on structure?	Found on hedgebanks and in coastal grassland. In Guernsey it is 'common inland and on the cliffs, alongside the paths and on bareish rocky slopes in more accessible areas' (La Societe Guernesiale 2005). Low lying plant which would have a minor or negligible effect on <20% of the lower strata.	L	MH
12. Effect on threatened flora?	This species is not documented as posing an additional risk to threatened flora.	MH	L
Fauna			
13. Effect on threatened fauna?	This species is not documented as posing an additional risk to threatened fauna.	MH	L
14. Effect on non-threatened fauna?	Insufficient information to determine whether or not the weed effects non-threatened fauna species. Score medium.	M	L
15. Benefits fauna?	Insufficient information to determine whether or not the weed provides benefits or facilitates the establishment of indigenous fauna. Score medium.	M	L
16. Injurious to fauna?	Weed not documented to be toxic or have spines, burrs which affect indigenous fauna but insufficient information to draw conclusions. Score medium.	M	L
Pest Animal			
17. Food source to pests?	Insufficient information to determine whether weed provides a food source to assist in success of pest animals. Score as medium.	M	L
18. Provides harbour?	Insufficient information to determine whether weed provides harbour for serious pest species. Score as medium.	M	L
Agriculture			
19. Impact yield?	Not documented as a weed of agriculture.	L	MH
20. Impact quality?	Not a weed of cropping.	L	MH
21. Affect land value?	Weed not known to affect land value.	L	MH
22. Change land use?	Weed not known to cause a change in priority of land use.	L	MH
23. Increase harvest costs?	Not a weed of cropping.	L	MH
24. Disease host/vector?	Weed not known as an alternative host or vector of disease.	L	MH

Impact Assessment Record

Scientific Name: *Hypericum humifusum*

Common name: trailing St. John's wort

References cited:

French National Institute for Agricultural Research 2001, *Hypericum humifusum*, L., Hypermedia for Plant Protection, viewed 16 Jan 2006,
http://www.dijon.inra.fr/malherbo/hyppa/hyppa-a/hyphu_ah.htm

La Societe Guernesiaise 2005, *Interesting plants of Guernsey: Hypericum humifusum*, La Societe Guernesiaise, viewed 16 Jan 2006,
<http://www.guernsey.net/~cdavid/botany/files/hypericum%20humifusum/index.html>

Tutin, T.G., Heywood, V.H., Burges, N.A., Valentine, D.H., Walters, S.M. & Webb, D.A. (eds) 1968, *Flora of Europaea, vol.2, Roasaceae to Umbelliferae*, Cambridge University Press, Cambridge.

Revisions

Date	Revised by	Revision

Invasiveness Assessment Record

Scientific name: *Koelreuteria elegans ssp formosana*

Common Name: Chinese rain tree

QUESTION	COMMENTS	RATING	CONFIDENCE
Establishment			
1. Germination requirements?	‘Germinates in late winter’ (CRC for Australian Weed Management 2003). Requires natural seasonal temperatures for germination.	MH	M
2. Establishment requirements?	‘.. successful germination of seed and subsequent growth of the seedling to maturity is dependent on the level of sunlight penetration’ However, can tolerate partial shade (CRC for Australian Weed Management 2003).	MH	M
3. How much disturbance is required?	In Brisbane, it has ‘invaded urban parks, bushland, gullies and streets’ (CRC for Australian Weed Management 2003). Establishes in highly disturbed natural ecosystems.	ML	M
Growth/Competitive			
4. Life form?	Tree Life form – other.	L	MH
5. Allelopathic properties?	None described (PIER 2005).	L	M
6. Tolerates herb pressure?	No evidence to suggest that plant is affected by herbivores.	H	M
7. Normal growth rate?	‘Growth rate: Fast .. minimum for a fast growing medium tree’ (PIER 2005). Moderately rapid growth that will equal competitive species of same life form.	MH	MH
8. Stress tolerance to frost, drought, w/logg, sal. etc?	‘It tolerates full sun, partial shade, drought, frost, heat, well drained to wet soils, extended flooding and air pollution. ... may be tolerant of light salt spray, but not saline conditions’ (CRC for Australian Weed Management 2003). Highly tolerant of frost, drought and waterlogging. Susceptible to salinity.	MH	M
Reproduction			
9. Reproductive system	Reproduces by seed (CRC for Australian Weed Management 2003). ‘As observed in .. <i>K. elegans</i> subsp. <i>formosana</i> , the flowers are entomophilous, bees and other small insects being the usual pollinators’ (Meyer 1976).	L	MH
10. Number of propagules produced?	‘Fruits are up to 50mm long and appear in large drooping clusters. The seeds are small, black and round and about 5mm in diameter (CRC for Australian Weed Management 2003). ‘.. relatively large seed based on photo, two seed per fruit and roughly 100-200 seeds per panicle’ (PIER 2005). Trees likely to produce greater than 2000 propagules per flowering event.	H	MH
11. Propagule longevity?	‘Not known exactly how long seeds can survive in the soil .. experiments have shown that the seeds can achieve a 90-100% success rate of germination after 10 months of moist storage .. may be viable for some time’ (CRC for Australian Weed Management 2003). Insufficient information to determine longevity – score medium.	M	M
12. Reproductive period?	Insufficient information to determine length of reproductive period but would be greater than 3 years. Score as Medium High.	MH	L
13. Time to reproductive maturity?	Insufficient information to determine time to reach reproductive maturity. Score as Medium.	M	L

Invasiveness Assessment Record

Scientific name: *Koelreuteria elegans ssp formosana*

Common Name: Chinese rain tree

QUESTION	COMMENTS	RATING	CONFIDENCE
Dispersal			
14. Number of mechanisms?	'Not known exactly how seeds are dispersed ... possible that water may contribute, as supported by evidence of infestation of gullies in Brisbane..... birds may also be a factor in facilitating the spread' (CRC for Australian Weed Management 2003). Insufficient evidence – score as medium.	M	M
15. How far do they disperse?	Insufficient information relating to dispersal. Score medium.	M	L

References cited:

CRC for Australian Weed Management 2003, *Weed management guide: Chinese rain tree* (*Koelreuteria elegans ssp. formosana*), CRC for Australian Weed Management and Commonwealth Department of the Environment and Heritage, viewed 10 Jan 2006, http://www.weeds.crc.org.au/documents/wmg_chinese_rain_tree.pdf

Meyer, F.G. 1976, 'A revision of the genus *Koelreuteria* (Sapindaceae)', *Journal of the Arnold Arboretum*, vol. 57, no. 2, pp. 129-166.

Pacific Island Ecosystems at Risk, 2005, *Koelreuteria elegans risk assessment*, Pacific Island Ecosystems at Risk, Hawaiian Ecosystems at Risk Project, viewed 10 Jan 2006, http://www.hear.org/pier/wra/pacific/koelreuteria_elegans_htmlwra.htm

Revisions

Date Revised by Revision

Present distribution of *Koelreuteria elegans* subsp. *formosana* in Victoria

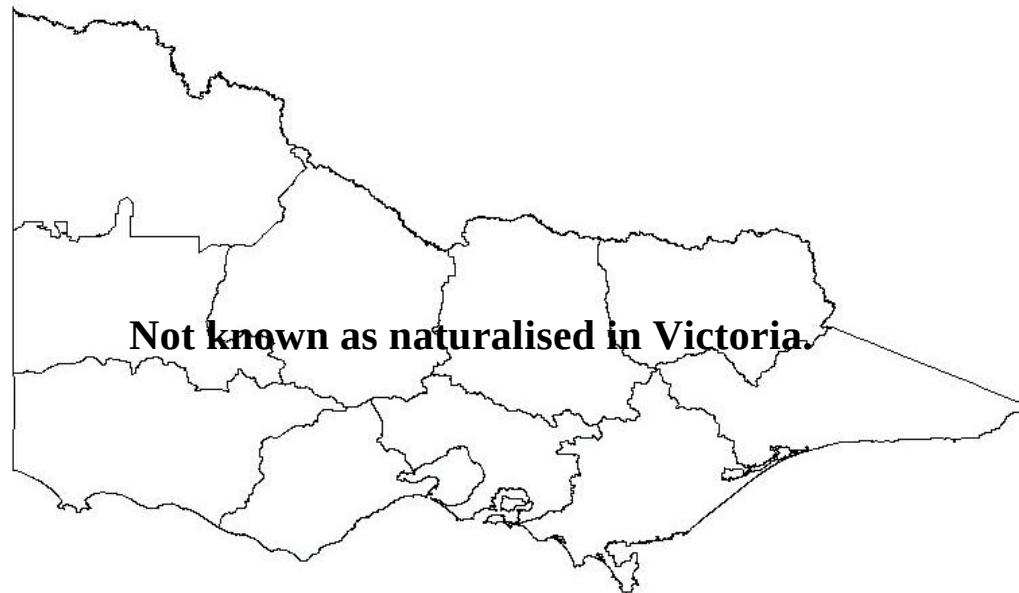
Scientific name: *Koelreuteria elegans* subsp. *formosana*

Common name(s): Chinese rain tree

Status:

Habitat:

Temperate climates. In Australia it grows amongst other weeds and native species in urban bushland, gullies, parks, undeveloped land and streets. Tolerates full sun, partial shade, drought, frost, heat, well drained to wet soils, extended flooding and air pollution. (CRC for Australian Weed Management 2003). Invades roadside woodlands (PIER 2005).



Potential distribution of *Koelreuteria elegans* subsp. *formosana* in Victoria

Scientific name: *Koelreuteria elegans* subsp. *formosana*

Common name(s): Chinese rain tree

Status:

Habitat:

Temperate climates. In Australia it grows amongst other weeds and native species in urban bushland, gullies, parks, undeveloped land and streets. Tolerates full sun, partial shade, drought, frost, heat, well drained to wet soils, extended flooding and air pollution. (CRC for Australian Weed Management 2003). Invades roadside woodlands (PIER 2005).

Potential distribution produced from CLIMATE modelling refined by applying suitable landuse and vegetation type overlays with CMA boundaries

MAP OVERLAYS USED.

Land Use:

Pasture dryland
Pasture irrigation

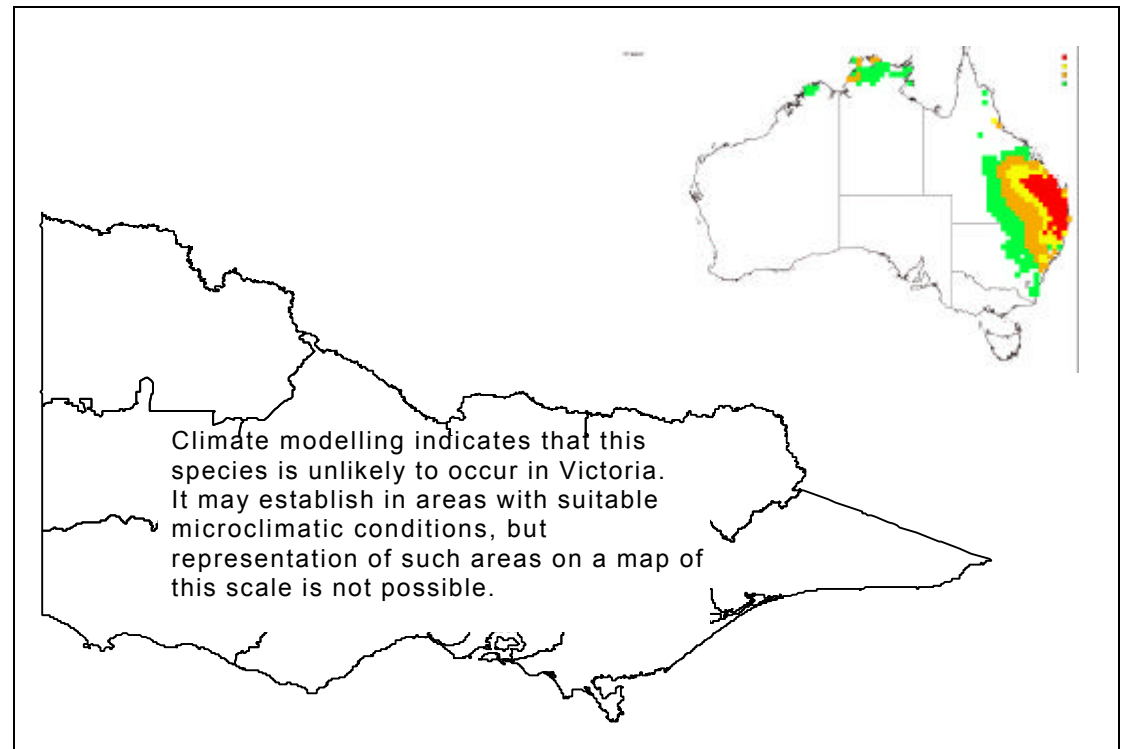
Broad vegetation types

Grassland; Plains grassy woodland; Riverine grassy woodland

Colours indicate possibility of *Koelreuteria elegans* subsp. *formosana* infesting these areas.

 Red	= Very high	 Yellow	= High
 Orange	= Medium	 Green	= Likely

In the non-coloured areas the plant is unlikely to establish as the climate, soil or landuse is not presently suitable.



Impact Assessment Record

Scientific Name: *Koelreuteria elegans* ssp *formosana*

Common name: Chinese rain tree

QUESTION	COMMENTS	RATING	CONFIDENCE
Social			
1. Restrict human access?	Grows to approximately 5 metres tall (up to 18 metres under ideal conditions). Has 'a dense rounded crown and may achieve a spread of 10-15m when mature (CRC for Australian Weed Management 2003). No record of the plant forming clusters. Would have minimal or negligible impact.	L	M
2. Reduce tourism?	'Abundant, colourful yellow flowers and pink, inflated fruit' (CRC for Australian Weed Management 2003). Grows up to 5 metres with dense crown. May have minor effect on aesthetics.	ML	M
3. Injurious to people?	Although species may cause 'vomiting, abdominal pain, and in some cases diarrhea, there is no evidence that it is consumed' (PIER 2005).	L	MH
4. Damage to cultural sites?	'Abundant, colourful yellow flowers and pink, inflated fruit' (CRC for Australian Weed Management 2003). Grows up to 15 metres with dense crown. Moderate visual effect.	ML	M
Abiotic			
5. Impact flow?	Terrestrial species (PIER 2005).	L	MH
6. Impact water quality?	Terrestrial species (PIER 2005).	L	MH
7. Increase soil erosion?	Deciduous tree. Would leave some of the ground exposed for a period of time. Can occur in gullies but unlikely to contribute to large-scale soil erosion.	L	M
8. Reduce biomass?	Because of 'its rapid growth habit and high seed viability.. may crowd out native plant populations (CRC for Australian Weed Management 2003). Would depend on the area that the plant establishes but likely to be a direct replacement of biomass.	ML	M
9. Change fire regime?	Tree is of low flammability (PIER 2005). Small or negligible effect on fire risk.	L	MH
Community Habitat			
10. Impact on composition (a) high value EVC	Potential distribution of <i>Koelreuteria elegans</i> excludes Victoria. No impact on EVCs in Victoria.	L	H
(b) medium value EVC	Potential distribution of <i>Koelreuteria elegans</i> excludes Victoria. No impact on EVCs in Victoria.	L	H
(c) low value EVC	Potential distribution of <i>Koelreuteria elegans</i> excludes Victoria. No impact on EVCs in Victoria.	L	H
11. Impact on structure?	Because of 'its rapid growth habit and high seed viability.. may crowd out native plant populations (CRC for Australian Weed Management 2003). Would have a major effect on less than 60% of the floral strata.	MH	M
12. Effect on threatened flora?	This species is not documented as posing an additional risk to threatened flora.	MH	L

Impact Assessment Record

Scientific Name: *Koelreuteria elegans ssp formosana*

Common name: Chinese rain tree

QUESTION	COMMENTS	RATING	CONFIDENCE
Fauna			
13. Effect on threatened fauna?	This species is not documented as posing an additional risk to threatened flora.	MH	L
14. Effect on non-threatened fauna?	Not documented as having an effect on non-threatened fauna.	L	M
15. Benefits fauna?	No evidence that the plant benefits fauna.	H	M
16. Injurious to fauna?	Plant not documented to be toxic or have burrs or spines (PIER 2005).	L	MH
Pest Animal			
17. Food source to pests?	No evidence that the plant provides a food source to pest species.	L	M
18. Provides harbor?	No evidence that the plant provides harbour for pest species.	L	M
Agriculture			
19. Impact yield?	Not recorded as a weed of agriculture (PIER 2005).	L	MH
20. Impact quality?	Not a weed of cropping (PIER 2005).	L	MH
21. Affect land value?	No evidence that the weed would effect land value. Can be well controlled by herbicides (PIER 2005).	L	MH
22. Change land use?	No evidence that the weed would cause a change in priority of land use. Can be well controlled by herbicides (PIER 2005).	L	MH
23. Increase harvest costs?	Not a weed of agriculture (PIER 2005).	L	MH
24. Disease host/vector?	Not a known host or vector for disease of agriculture.	L	M

Impact Assessment Record

Scientific Name: *Koelreuteria elegans ssp formosana*

Common name: Chinese rain tree

References cited:

CRC for Australian Weed Management 2003, *Weed management guide: Chinese rain tree* (*Koelreuteria elegans ssp. formosana*), CRC for Australian Weed Management and Commonwealth Department of the Environment and Heritage, viewed 10 Jan 2006, http://www.weeds.crc.org.au/documents/wmg_chinese_rain_tree.pdf

Pacific Island Ecosystems at Risk, 2005, *Koelreuteria elegans risk assessment*, Pacific Island Ecosystems at Risk, Hawaiian Ecosystems at Risk Project, viewed 10 Jan 2006, http://www.hear.org/pier/wra/pacific/koelreuteria_elegans_htmlwra.htm

Revisions

Date	Revised by	Revision

Invasiveness Assessment Record

Scientific name: *Lachenalia reflexa*

Common Name: yellow soldier

QUESTION	COMMENTS	RATING	CONFIDENCE
Establishment			
1. Germination requirements?	'Often germinate in response to fire' (CRC for Australian Weed Management 2003). Germinates during spring (CRC for Australian Weed management 2003). Requires natural seasonal conditions.	MH	M
2. Establishment requirements?	Plants take advantage of bare ground (CRC for Australian Weed Management 2003). Can be in a sun or semi-shady position (Hitchmough 1992) but shows preference for full-sun.	ML	M
3. How much disturbance is required?	'It invades banksia/ tuart woodlands and limestone scrub and heath' 'The infestation in the Shenton bushland has shown that yellow soldier does not need disturbance to establish (CRC for Australian Weed Management 2003).	H	M
Growth/Competitive			
4. Life form?	Stores food in bulbs (CRC for Australian Weed Management 2003). Geophyte.	ML	M
5. Allelopathic properties?	None described in CRC for Australian Weed management 2003.	L	M
6. Tolerates herb pressure?	' <i>Lachenalia</i> are easy, trouble-free bulbs. The only pests .. likely to be encountered are aphids, which may cause puckering of the leaves' (Hitchmough 1992). Consumed but recovers quickly.	MH	M
7. Normal growth rate?	Plant takes advantage of open spaces but no information to suggest that its growth rate would exceed other species of same life form. Score as medium.	M	L
8. Stress tolerance to frost, drought, w/logg, sal. etc?	'In its native range .. it occurs in areas with winter rainfall, undergoing long dormant periods over the dry summers' (CRC for Australian Weed Management 2003). 'Fire does not appear to kill bulbs as plants flower prolifically the first season following fire (Brown et al 2002). Found on sandy calcareous soils – assume some level of tolerance to salinity. May be susceptible to frost.	MH	H
Reproduction			
9. Reproductive system	'Spreads mainly by seed' (CRC for Australian Weed Management 2003), but can also reproduce vegetatively through bulbs.	H	M
10. Number of propagules produced?	'.. usually between one and ten flowers per plant and each flower produces a capsule that contains 40-60 seeds' (CRC for Australian Weed Management 2003). Plant would produce maximum of 600 propagules.	ML	M
11. Propagule longevity?	'The seed does not appear to remain viable for more than two or three years' (CRC for Australian Weed Management 2003).	L	M
12. Reproductive period?	'.. flowering-sized bulbs can be produced by the second or third year' (Hitchmough 1992). Not sufficient information to determine whether plant produces viable propagules for greater than 10 years.	MH	M
13. Time to reproductive maturity?	'Single annually renewed bulb' (CRC for Australian Weed Management 2003). Germinates in spring and flowers in following winter or early spring.	H	M
Dispersal			
14. Number of mechanisms?	'Water movement and human activity are the main causes of seed spread' (CRC for Australian Weed Management 2003).	MH	M

Invasiveness Assessment Record

Scientific name: *Lachenalia reflexa*

Common Name: yellow soldier

QUESTION	COMMENTS	RATING	CONFIDENCE
15. How far do they disperse?	'Experience in the Shenton bushland .. suggests that seed is not easily spread over long distances ' (CRC for Australian Weed Management 2003). Very unlikely to disperse greater than 200m.	L	M

References cited:

Brown, K., Brooks, K., Madden, S. & Marshall, J. 2002, 'Control of the exotic bulb, yellow soldier (*Lachenalia reflexa*) invading a banksia woodland, Perth, Western Australia', *Ecological Management & Restoration*, vol. 3, no. 1, pp. 28–36.

CRC for Australian Weed Management 2003, *Weed management guide: Yellow soldier* (*Lachenalia reflexa*), CRC for Australian Weed Management and Commonwealth Department of the Environment and Heritage, viewed 10 Jan 2006, http://www.weeds.crc.org.au/documents/wmg_lachenalia.pdf

Hitchmough, J. 1992, *Garden bulbs: A seasonal planting and flowering guide for all Australian regions*, Viking O'Neil, Ringwood.

Revisions

Date	Revised by	Revision

Present distribution of *Lachenalia reflexa* in Victoria

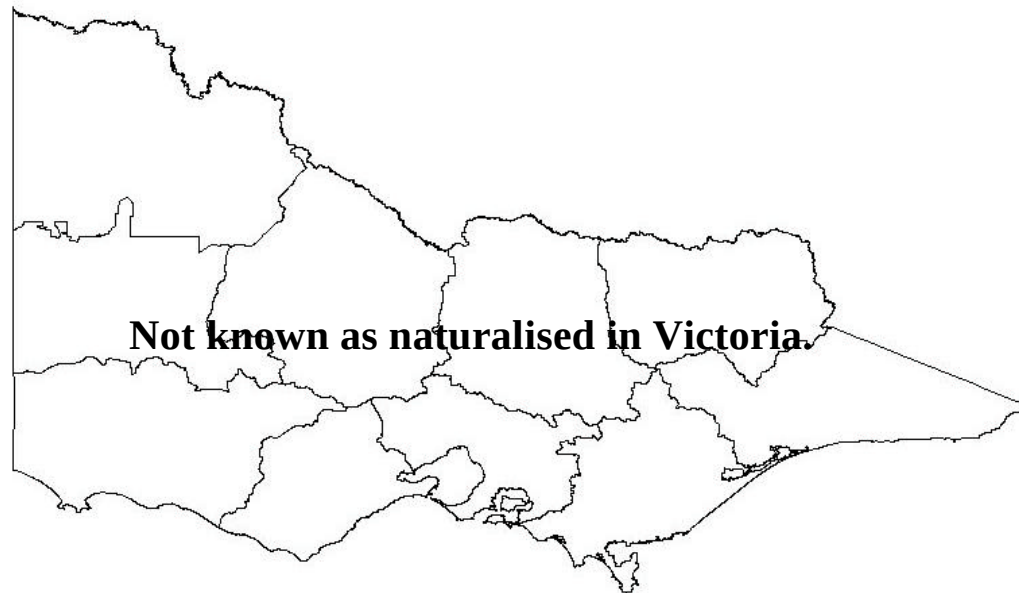
Scientific name: *Lachenalia reflexa* Thunb.

Common name(s): yellow soldier

Status:

Habitat:

In its native range in South Africa it occurs in winter wet rainfall areas. In Perth, it occurs on sandy or calcareous soils and found invading Banksia/Tuart Woodlands, Banksia/Jarrah woodlands, Tuart Woodlands and limestone scrub and heath. (Brown *et al* 2002).



Potential distribution of *Lachenalia reflexa* in Victoria

Scientific name: *Lachenalia reflexa* Thunb.

Common name(s): yellow soldier

Status:

Habitat:

In its native range in South Africa it occurs in winter wet rainfall areas. In Perth, it occurs on sandy or calcareous soils and found invading Banksia/Tuart Woodlands, Banksia/Jarrah woodlands, Tuart Woodlands and limestone scrub and heath. (Brown *et al* 2002).

Potential distribution produced from CLIMATE modelling refined by applying suitable landuse and vegetation type overlays with CMA boundaries

MAP OVERLAYS USED.

Land Use:

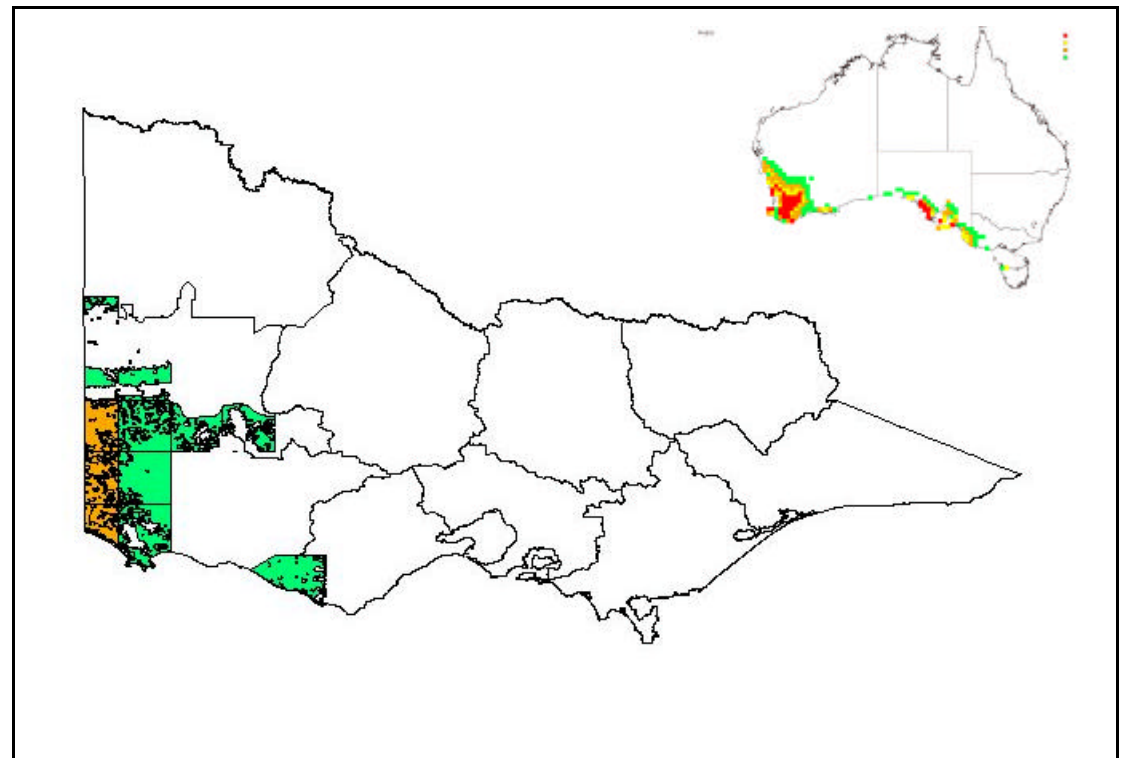
Broad vegetation types

Coastal scrubs and grassland; coastal grassy woodland; heathy woodland; heath; sedge-rich woodland; grassland; plains grassy woodland; herb-rich woodland; riverine grassy woodland; rainshadow woodland; mallee; mallee heath; mallee woodland; Wimmera/Mallee woodland.

Colours indicate possibility of *Lachenalia reflexa* infesting these areas.

Red	= Very high	Yellow	= High
Orange	= Medium	Green	= Likely

In the non-coloured areas the plant is unlikely to establish as the climate, soil or landuse is not presently suitable.



Impact Assessment Record

Scientific Name: Lachenalia reflexa

Common name: yellow soldier

QUESTION	COMMENTS	RATING	CONFIDENCE
Social			
1. Restrict human access?	Low growing plant reaching up to 100mm (CRC for Australian Weed Management 2003). Weed would not restrict human access.	L	M
2. Reduce tourism?	'Can reduce the recreational enjoyment of bushland by people' (CRC for Australian Weed Management 2003). May have a minor effect on aesthetics.	ML	M
3. Injurious to people?	Weed not documented as having any injurious or toxic effects.	L	M
4. Damage to cultural sites?	Plant not recorded as having an effect on cultural sites.	L	M
Abiotic			
5. Impact flow?	Terrestrial species.	L	M
6. Impact water quality?	Terrestrial species.	L	M
7. Increase soil erosion?	Plant dies off during summer months (CRC for Australian Weed Management 2003) so would leave some ground exposed although low probability of low scale soil movement.	L	M
8. Reduce biomass?	'Replaces native herbs and annuals in both disturbed and relatively intact bushland' (CRC for Australian Weed Management 2003). Plants die off during summer months. May be periods where biomass is slightly decreased.	MH	M
9. Change fire regime?	Although fire tolerant, no evidence to suggest that the weed would effect the frequency or intensity of fires.	L	M
Community Habitat			
10. Impact on composition (a) high value EVC	EVC= Coastal Mallee Scrub (E); CMA=Glenelg Hopkins; Bioreg=Glenelg Plain; CLIMATE potential=M. '.. around Perth where it appears to be replacing the herbaceous and annual components of the native understorey' (CRC for Australian Weed Management). Displaces all species within the groundcover layer.	H	M
(b) medium value EVC	EVC= Heathy herbrich woodland (D); CMA=Glenelg Hopkins; Bioreg=Glenelg Plain; CLIMATE potential=M. '.. around Perth where it appears to be replacing the herbaceous and annual components of the native understorey' (CRC for Australian Weed Management). Displaces all species within the groundcover layer.	H	M
(c) low value EVC	EVC= Heathy woodland (LC); CMA=Glenelg Hopkins; Bioreg=Glenelg Plain; CLIMATE potential=M. '.. around Perth where it appears to be replacing the herbaceous and annual components of the native understorey' (CRC for Australian Weed Management). Displaces all species within the groundcover layer.	H	M
11. Impact on structure?	'.. around Perth where it appears to be replacing the herbaceous and annual components of the native understorey' (CRC for Australian Weed Management). Major effect on understorey.	MH	M

Impact Assessment Record

Scientific Name: Lachenalia reflexa

Common name: yellow soldier

QUESTION	COMMENTS	RATING	CONFIDENCE
12. Effect on threatened flora?	This species is not documented as posing an additional risk to threatened flora.	MH	L
Fauna			
13. Effect on threatened fauna?	This species is not documented as posing an additional risk to threatened fauna.	MH	L
14. Effect on non-threatened fauna?	Weed not documented to have an effect on non-threatened fauna species.	L	M
15. Benefits fauna?	Weed not documented to provide support to desirable species.	H	M
16. Injurious to fauna?	Weed not documented to be toxic or have spines or burrs which may affect indigenous fauna.	L	M
Pest Animal			
17. Food source to pests?	Not documented as a food source for pest species.	L	M
18. Provides harbor?	Weed not documented to provide harbour for pest species.	L	M
Agriculture			
19. Impact yield?	Not a weed of agriculture.	L	M
20. Impact quality?	Not a weed of cropping.	L	M
21. Affect land value?	Weed not known to have an effect on land value.	L	M
22. Change land use?	Weed not known to cause change in priority of land use.	L	M
23. Increase harvest costs?	Not a weed of cropping.	L	M
24. Disease host/vector?	Not a known host or vector for disease of agriculture.	L	M

Impact Assessment Record

Scientific Name: *Lachenalia reflexa*

Common name: yellow soldier

References cited:

Brown, K., Brooks, K., Madden, S. & Marshall, J. 2002, 'Control of the exotic bulb, yellow soldier (*Lachenalia reflexa*) invading a banksia woodland, Perth, Western Australia', *Ecological Management & Restoration*, vol. 3, no. 1, pp. 28–36.

CRC for Australian Weed Management 2003, *Weed management guide: Yellow soldier* (*Lachenalia reflexa*), CRC for Australian Weed Management and Commonwealth Department of the Environment and Heritage, viewed 10 Jan 2006, http://www.weeds.crc.org.au/documents/wmg_lachenalia.pdf

Revisions

Date	Revised by	Revision

Invasiveness Assessment Record

Scientific name: *Lantana camara*

Common Name: lantana

QUESTION	COMMENTS	RATING	CONFIDENCE
Establishment			
1. Germination requirements?	Activities that increase light intensity and soil temperature will stimulate germination (NHT 2004). Seeds need warm temperatures and sufficient moisture to germinate but with these conditions present can germinate throughout the year, peaking after the first summer rains (Swarbrick, Willson & Hannan-Jones 1998).	MH	MH
2. Establishment requirements?	Thrives in high rainfall areas of tropical, subtropical and warm temperate climates (NHT 2004). Can tolerate partial, but not complete shading and dominates understoreys (Swarbrick, Willson & Hannan-Jones 1998). Can establish in minor disturbed natural ecosystems.	ML	MH
3. How much disturbance is required?	Human disturbances such as clearing, construction and inappropriate burning will stimulate germination (NHT 2004). Serious invader of disturbed ecosystems and persists along roadsides, creeks and other open situations. Infests forest edges, coastal zones and riparian areas, penetrates disturbed rainforest and invades open eucalypt woodland.(Swarbrick, Willson & Hannan-Jones 1998).	MH	MH
Growth/Competitive			
4. Life form?	Much-branched, thicket-forming perennial shrub (Swarbrick, Willson & Hannan-Jones 1998) – Life form other.	L	MH
5. Allelopathic properties?	Excludes other species through allelopathic effects (NHT 2004). Shown to be allelopathic to citrus and may be to many endemic Australian plants (Swarbrick, Willson & Hannan-Jones 1998).	MH	MH
6. Tolerates herb pressure?	The plant is unpalatable and scarcely eaten but is under a biocontrol program in Queensland and New South Wales (Swarbrick, Willson & Hannan-Jones 1998).	MH	MH
7. Normal growth rate?	Mainly an invader of open woodland, however the dense thickets exclude native species through smothering and dominates understoreys (NHT 2004). It often forms mono-specific stands to the exclusion of native herbs, shrubs and tree and climber seedlings (Swarbrick, Willson & Hannan-Jones 1998).	H	MH
8. Stress tolerance to frost, drought, w/logg, sal. etc?	New shoots are frost sensitive and growth is prevented below 5°C (NHT 2004). Can survive prolonged dry periods but does not tolerate waterlogging. Very low tolerance to soil salinity. Fire as a control measure is insufficient by itself as plant recovers quickly afterwards (Swarbrick, Wilson & Hannan-Jones 1998). Tolerant to at least two and susceptible to at least two.	ML	MH
Reproduction			
9. Reproductive system	Both self and cross pollination are possible. Can spread via layering whereby horizontal stems take root when in contact with moist soil (Swarbrick, Wilson & Hannan-Jones 1998). Also reshoots vigorously from dormant buds at the base stems (NHT 2004).	H	MH
10. Number of propagules produced?	A single plant can produce up to 12000 fruit each year (NHT 2004).	H	M
11. Propagule longevity?	Studies show that 50% of seed will remain viable in dry conditions for up to two years (NHT 2004). Unpublished studies have shown seed viability of four to five years.	L	M
12. Reproductive period?	‘Very long-lived under favourable conditions...plants tend to die only under extremely stressful conditions such as extended drought or complete shading through canopy closure’ (NHT 2004). Can form self-sustaining mono-specific stands (Swarbrick, Wilson & Hannan-Jones 1998).	H	MH

Invasiveness Assessment Record

Scientific name: *Lantana camara*

Common Name: lantana

QUESTION	COMMENTS	RATING	CONFIDENCE
13. Time to reproductive maturity?	The first flowers are produced in the field during the second summer but in greenhouse studies have been produced six months after germination (Parsons & Cuthbertson 1992).	MH	MH
Dispersal			
14. Number of mechanisms?	Fruit eating birds are the main agents of dispersal (through droppings). Some mammals, especially foxes, also disperse seed (NHT 2004).	H	M
15. How far do they disperse?	Most fruits are dispersed by birds, often locally, but can be to distances of up to 1 km or more (Swarbrick, Willson & Hannan-Jones 1998).	H	MH

References cited:

Natural Heritage Trust, the Department of Natural Resources, Mines and Energy, Queensland and New South Wales Department of Agriculture 2004, Lantana control manual: current management and control options for lantana (*Lantana camara*) in Australia, Department of Natural Resources, Mines and Energy, Brisbane, viewed: 26 October 2005, http://www.weeds.org.au/docs/Lantana_Management.pdf

Parsons, W.T. & Cuthbertson, E. G. 2001, *Noxious weeds of Australia*, 2nd edn, CSIRO Publishing, Collingwood.

Swarbick, J.T., Willson, B.W. & Hannan-Jones, M.A. 1998, '*Lantana camara* L.', in *The biology of Australian weeds*, eds F.D. Panetta, R.H. Groves & R.C.H. Shepherd, R.G. and F.J. Richardson, Melbourne.

Revisions

Date Revised by Revision

Present distribution of *Lantana camara* in Victoria

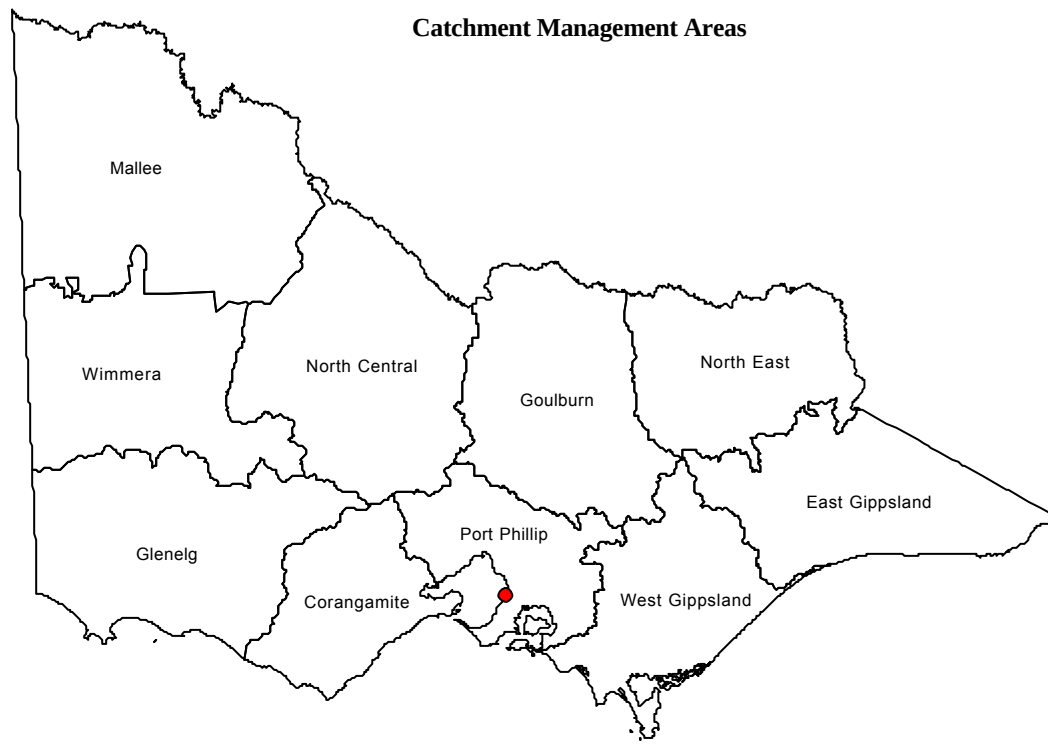
Scientific name: *Lantana camara* L.

Common name(s): lantana

Status:

Habitat:

Warm temperate, subtropical and tropical climates. Doesn't grow at temperatures below 5°C and shoots are sensitive to frost. Grows best in constant rainfall or in areas of high soil moisture. Grows on rich organic soils, well drained clay soils and volcanic soils derived from basalts. Invades open and semi-open plant communities such as road verges, grasslands and woodlands, and proliferates under lightly shaded conditions such as mature hoop pine plantations. Also forms monospecific stands along road sides and fence lines and in open grasslands. (Swarbrick, Wilson and Hannan-Jones 1998)



Potential distribution of *Lantana camara* in Victoria

Scientific name: *Lantana camara* L.

Common name(s): lantana

Status:

Habitat:

Warm temperate, subtropical and tropical climates. Doesn't grow at temperatures below 5°C and shoots are sensitive to frost. Grows best in constant rainfall or in areas of high soil moisture. Grows on rich organic soils, well drained clay soils and volcanic soils derived from basalts. Invades open and semi-open plant communities such as road verges, grasslands and woodlands, and proliferates under lightly shaded conditions such as mature hoop pine plantations. Also forms monospecific stands along road sides and fence lines and in open grasslands. (Swarbrick, Wilson and Hannan-Jones 1998)

Potential distribution produced from CLIMATE modelling refined by applying suitable landuse and vegetation type overlays with CMA boundaries

MAP OVERLAYS USED.

Land Use:

Forest private plantation
Forest public plantation
Pasture dryland and irrigation

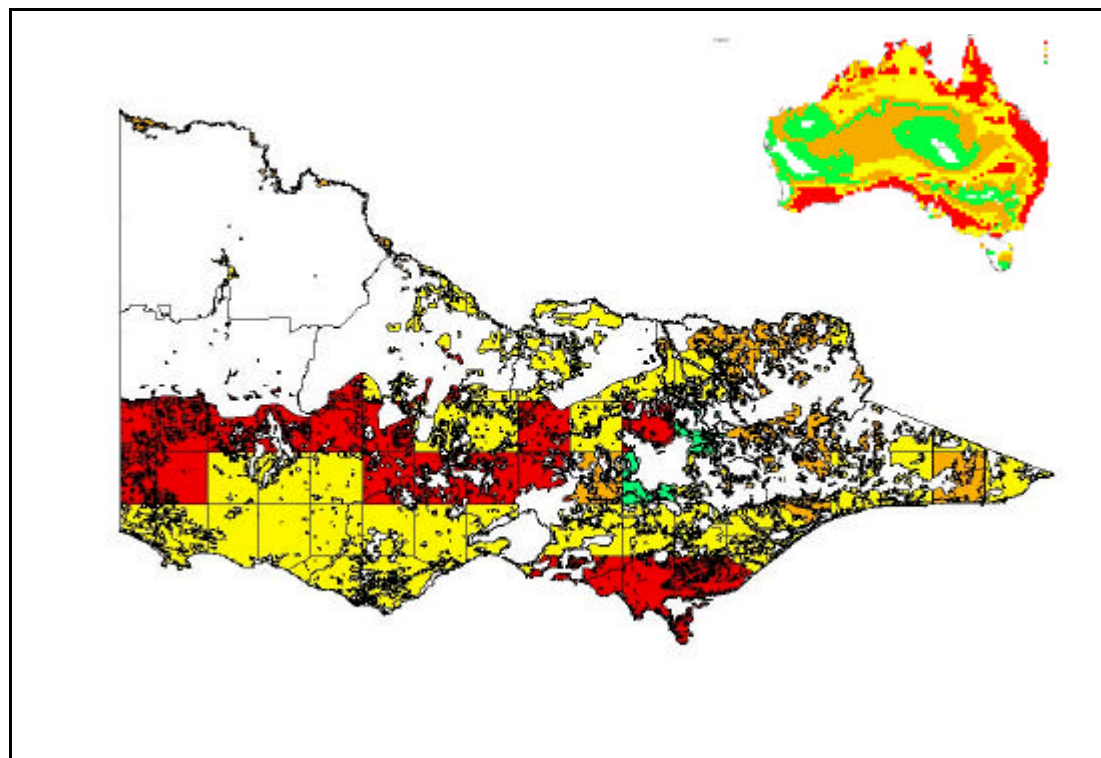
Broad vegetation types

Coastal scrubs and grassland; coastal grassy woodland; heathy woodland; lowland forest; heath; swamp scrub; box ironbark forest; inland slopes woodland; sedge-rich woodland; moist foothill forest; grassland; plains grassy woodland; valley grassy forest; herb-rich woodland; riverine grassy woodland; riparian forest

Colours indicate possibility of *Lantana camara* infesting these areas.

 Red	= Very high	 Yellow	= High
 Orange	= Medium	 Green	= Likely

In the non-coloured areas the plant is unlikely to establish as the climate, soil or landuse is not presently suitable.



Impact Assessment Record

Scientific Name: *Lantana camara*

Common name: lantana

QUESTION	COMMENTS	RATING	CONFIDENCE
Social			
1. Restrict human access?	“Thicket forming shrub 2 – 4 m tall. Stems are covered in prickles and interlink with adjacent plants to form dense, tangle, impenetrable thickets” (Muylt 2001). Human access severely restricted.	H	MH
2. Reduce tourism?	“It commonly forms dense mono-specific stands several metres tall...greatly reducing the area’s conservation value, making it impenetrable to people” (Panetta <i>et al.</i> 1998). Major impact on recreation.	H	MH
3. Injurious to people?	“Stems are armed with sharp recurved spines” (Parsons & Cuthbertson 2001). Potential to cause minor injury all year round.	MH	MH
4. Damage to cultural sites?	“It commonly forms dense mono-specific stands several metres tall” (Panetta <i>et al.</i> 1998). Not known to cause structural damage; likely have a moderate negative visual effect.	ML	MH
Abiotic			
5. Impact flow?	Terrestrial species (Parsons & Cuthbertson 2001).	L	MH
6. Impact water quality?	Terrestrial species (Parsons & Cuthbertson 2001).	L	MH
7. Increase soil erosion?	“Much-branched thicket forming shrubs to 3 m high. [The root system comprises a] robust, brown woody rootstock with numerous shallow laterals” (Parsons & Cuthbertson 2001). Unlikely to contribute to soil erosion.	L	MH
8. Reduce biomass?	“Lantana is mainly an invader of open (in Australia especially eucalypt) woodland. It commonly forms dense mono-specific stand several metres tall” (Panetta <i>et al.</i> 1998). Biomass may increase.	L	MH
9. Change fire regime?	In woodland communities it commonly forms dense mono-specific stands that, “greatly increase the fire hazard under dry conditions. Dry lantana burns readily even when green” (Panetta <i>et al.</i> 1998). Moderate change to both frequency and intensity of fire.	MH	MH
Community Habitat			
10. Impact on composition (a) high value EVC	EVC=Coastal Headland Scrub (V); CMA=West Gippsland; Bioreg=Wilsons Promontory. Climate=VH. “It commonly forms dense mono-specific stands several metres tall which exclude native herbs, shrubs and tree and climber seedlings, greatly reducing the area’s conservation value” (Panetta <i>et al.</i> 1998). Monoculture within a layer.	H	MH
(b) medium value EVC	EVC=Coastal Alkaline Scrub (D); CMA=West Gippsland; Bioreg=Gippsland Plain. Climate=VH. “It commonly forms dense mono-specific stands several metres tall which exclude native herbs, shrubs and tree and climber seedlings, greatly reducing the area’s conservation value” (Panetta <i>et al.</i> 1998). Monoculture within a layer.	H	MH
(c) low value EVC	EVC=Heathy Woodland (LC); CMA=West Gippsland; Bioreg=Wilsons Promontory; Climate=VH. “It commonly forms dense mono-specific stands several metres tall which exclude native herbs, shrubs and tree and climber seedlings, greatly reducing the area’s conservation value” (Panetta <i>et al.</i> 1998). Monoculture within a layer.	H	MH
11. Impact on structure?	“It commonly forms dense mono-specific stands several metres tall which exclude native herbs, shrubs and tree and climber seedlings, greatly reducing the area’s conservation value” (Panetta <i>et al.</i> 1998). Potential to form monoculture.	H	MH

Impact Assessment Record

Scientific Name: *Lantana camara*

Common name: lantana

QUESTION	COMMENTS	RATING	CONFIDENCE
12. Effect on threatened flora?	This species is not documented as posing an additional risk to threatened flora.	MH	L
Fauna			
13. Effect on threatened fauna?	This species is not documented as posing an additional risk to threatened fauna.	MH	L
14. Effect on non-threatened fauna?	“It commonly forms dense mono-specific stands several metres tall which exclude native herbs, shrubs and tree and climber seedlings” (Panetta <i>et al.</i> 1998). But, “Lantana thickets create a substitute habitat, providing food and shelter for some animal species” (ARMCANZ 2001). Structure is altered with reduced diversity; more importantly natural habitat is affected potentially leading to reduction in faunal populations.	MH	MH
15. Benefits fauna?	Lantana provides some shelter and food for native fauna (ARMCANZ 2001).	MH	MH
16. Injurious to fauna?	Although toxic to sheep and cattle, there is no evidence the plant affects native fauna (Parsons & Cuthbertson 2001).	L	MH
Pest Animal			
17. Food source to pests?	It is not documented as providing food to pest species. However, it is known to be an alternative food source for some native birds (ARMCANZ 2001). Potential food source to pest birds.	ML	MH
18. Provides harbor?	“The thickets provide shelter for animal pests” (Parsons & Cuthbertson 2001). “It provides harbour to vermin, including rabbits, foxes and feral cats” (Anon. (n.d.)).	H	MH
Agriculture			
19. Impact yield?	Direct impact on yield resulting from loss of pasture and animal deaths (ARMCANZ 2001). “Annual losses due to lantana in pastures are estimated to be \$A7.7m, comprising 1500 cattle deaths, 4.5% reduced performance, [and] 7.3% loss of pasture” (Panetta <i>et al.</i> 1998). Major impact on yield.	MH	MH
20. Impact quality?	Not known to affect the quality of produce. Not a weed of cropping.	L	MH
21. Affect land value?	Although not documented, the invasiveness of lantana, its impact on agricultural yield, its toxic properties and the cost of control all suggest that land values would be affected (Panetta <i>et al.</i> 1998). “It forms dense impenetrable thickets which impede access, alter fire regimes and reduce amenity and property values” (Anon (n.d.)).	H	MH
22. Change land use?	“Uncultivated pastures or neglected properties are readily invaded. Decline of traditional dairying /beef industries on the NSW and Queensland hinterlands and the expansion of rural subdivisions have resulted in many marginal grazing lands being abandoned and invaded by lantana” (ARMCANZ 2001). Left untreated, lantana infestations may result in a significant change in land use (or abandonment).	H	MH
23. Increase harvest costs?	Not known to affect the cost of harvesting produce.	L	MH
24. Disease host/vector?	“The thickets...act as alternative hosts for plant pathogens and pests such as <i>Aschochyta phaseolorum</i> , <i>Physalospora fusca</i> , and thrips (<i>Holothrips flaviceps</i> and <i>Thrips tabaci</i>)” (Parsons & Cuthbertson 2001). Serious pest of horticulture.	H	MH

Impact Assessment Record

Scientific Name: *Lantana camara*

Common name: lantana

References cited:

Agriculture and Resource Management Council of Australia & New Zealand, Australian & New Zealand Environment & Conservation Council and Forestry Ministers, (2001) *Weeds of National Significance Lantana (Lantana camara) Strategic Plan*. National Weeds Strategy Executive Committee, Launceston.

¹ Anon. (n.d.) *Beating Lantana on the NSW South Coast*. South Coast Bitou Bush Task Force. Available: <http://www.tosustain.com/bitoubush/lantana.pdf> Accessed 15/07/03
Parsons, W.T. & Cuthbertson, E. G. 2001, *Noxious weeds of Australia*, 2nd edn, CSIRO Publishing, Collingwood.

Revisions

Date	Revised by	Revision

Invasiveness Assessment Record

Scientific name: *Miconia* spp.

Common Name: miconia

QUESTION	COMMENTS	RATING	CONFIDENCE
Establishment			
1. Germination requirements?	‘Germination and seedling growth can occur under light levels as low as 0.02% of full sun’. In a laboratory experiment, some seeds germinated when exposed to light and moisture (Csurhes 1997). Opportunistic germinator.	H	H
2. Establishment requirements?	‘Germination and seedling growth can occur under light levels as low as 0.02% of full sun. This attribute facilitates the plant’s persistence in deep shade beneath rainforest canopies’ (Csurhes 1997). Can establish without additional factors.	H	H
3. How much disturbance is required?	<i>Miconia calvenscens</i> ‘persists in a wide range of habitats including primary and secondary rainforest in mesic and wet environments .. in areas of primary rainforest it appears to invade areas that show no obvious signs of disturbance’ (Csurhes 1997). ‘Occurs in coastland, disturbed areas, natural forest, planted forests, riparian zones, scrubs/ shrublands, urban areas, wetlands’ (ISSG 2005). Can establish in relatively intact natural ecosystems.	MH	H
Growth/Competitive			
4. Life form?	Tree (Csurhes 1997). Life form –other.	L	H
5. Allelopathic properties?	None described in Csurhes (1997).	L	H
6. Tolerates herb pressure?	The most damaging species is the Chinese rose beetle (<i>Adoretus sinicus</i>) which ‘causes up to 50% defoliation but does not cause tree mortality’ (Csurhes 1997). Capable of flowering / seed production under moderate herbivory pressure.	MH	H
7. Normal growth rate?	Medium-sized tree. ‘Under favourable conditions, juvenile specimens can grow up to 1.5m/year’ (Csurhes 1997). ‘Fast-growing’ (Weber 2003). Moderately rapid growth that will equal competitive species of the same life form.	MH	H
8. Stress tolerance to frost, drought, w/logg, sal. etc?	Native to tropical America and found in other tropical rainforests. Unlikely to be frost tolerant. Thrives in wet forests with annual precipitation between 1800-2000mm. (ISSG 2005). ‘Can tolerate otherwise poor growing conditions if adequate moisture is available’ Drought intolerant. Can tolerate saline conditions. Tolerant to at least 2 and susceptible to at least 2.	ML	MH
Reproduction			
9. Reproductive system	Capable of both self and cross pollination. Does not naturally reproduce vegetatively but can through cuttings (ISSG 2005).	ML	MH
10. Number of propagules produced?	‘A young tree with only two panicles can produce ca. 200,000 seeds in its first fruiting season, whereas an older tree, with over 50 panicles, can produce over 5 million seeds per annum’ (Csurhes 1997).	H	H
11. Propagule longevity?	‘Seeds can remain viable for at least four years’ (Csurhes 1997). ‘Longevity of the soils seed bank > 6-8 years’ (ISSG 2005).	L	H
12. Reproductive period?	In Tahiti <i>Miconia calvenscens</i> has ‘naturalized over 65% of the island and has formed dense, monospecific stands over 25% of the island’ (Csurhes 1997). Species forms self-sustaining dense monocultures.	H	H

Invasiveness Assessment Record

Scientific name: *Miconia* spp.

Common Name: miconia

QUESTION	COMMENTS	RATING	CONFIDENCE
13. Time to reproductive maturity?	'Reproduce when four to five years old' (Csurhes 1997).	ML	H
Dispersal			
14. Number of mechanisms?	'Although most fruit falls beneath the parent tree, the seed is small enough to be moved by wind and water' Bird and rodent dispersed. Can adhere to mud and vehicles (Csurhes 1997).	H	H
15. How far do they disperse?	'Individual birds can carry thousands of seeds at least up to 2km' (ISSG 2005). Very likely that some propagules will disperse greater than 1 km.	H	MH

References cited:

Csurhes, S.M. 1997, '*Miconia calvenscens*, a potentially invasive plant in Australia's tropical and sub-tropical rainforests in *Proceedings of the First Regional Conference on Miconia Control*, Papeete, August 26-29, pp. 72-77.

Invasive Species Specialist Group 2005, *Miconia calvenscens (tree)*, Global Invasive Species Database, The World Conservation Union, viewed 10 Jan 2006, <http://www.issg.org/database/species/ecology.asp?si=2&fr=1&sts=sss>

Revisions

Date Revised by Revision

Present distribution of *Miconia* spp. in Victoria

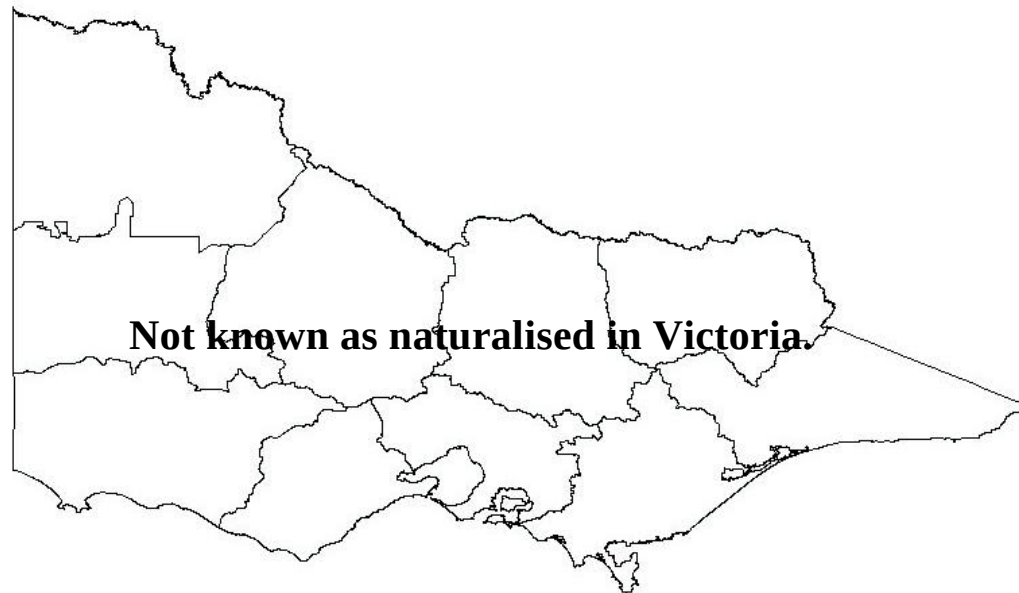
Scientific name: *Miconia calvescens* DC., *Miconia racemosa*

Common name(s): miconia

Status:

Habitat:

Miconia calvescens: Occurs in tropical montane climate (HEAR 1997). Occurs in coastland, disturbed areas, natural forest, planted forests, riparian zones, scrub/shrublands, urban areas, wetlands (ISSG 2005). Forest, forest edges and grassland (Weber 2003). Mean annual rainfall > 2000 mm. Elevations at 10 – 1300m (Csurhes 1997).



Potential distribution of *Miconia* spp. in Victoria

Scientific name: *Miconia calvescens* DC., *Miconia racemosa*

Common name(s): miconia

Status:

Habitat: *Miconia calvescens*: Occurs in tropical montane climate (HEAR 1997). Occurs in coastland, disturbed areas, natural forest, planted forests, riparian zones, scrub/shrublands, urban areas, wetlands (ISSG 2005). Forest, forest edges and grassland (Weber 2003). Mean annual rainfall > 2000 mm. Elevations at 10 – 1300m (Csurhes 1997).

Potential distribution produced from CLIMATE modelling refined by applying suitable landuse and vegetation type overlays with CMA boundaries

MAP OVERLAYS USED.

Land Use:

Forest private plantation
Forest public plantation

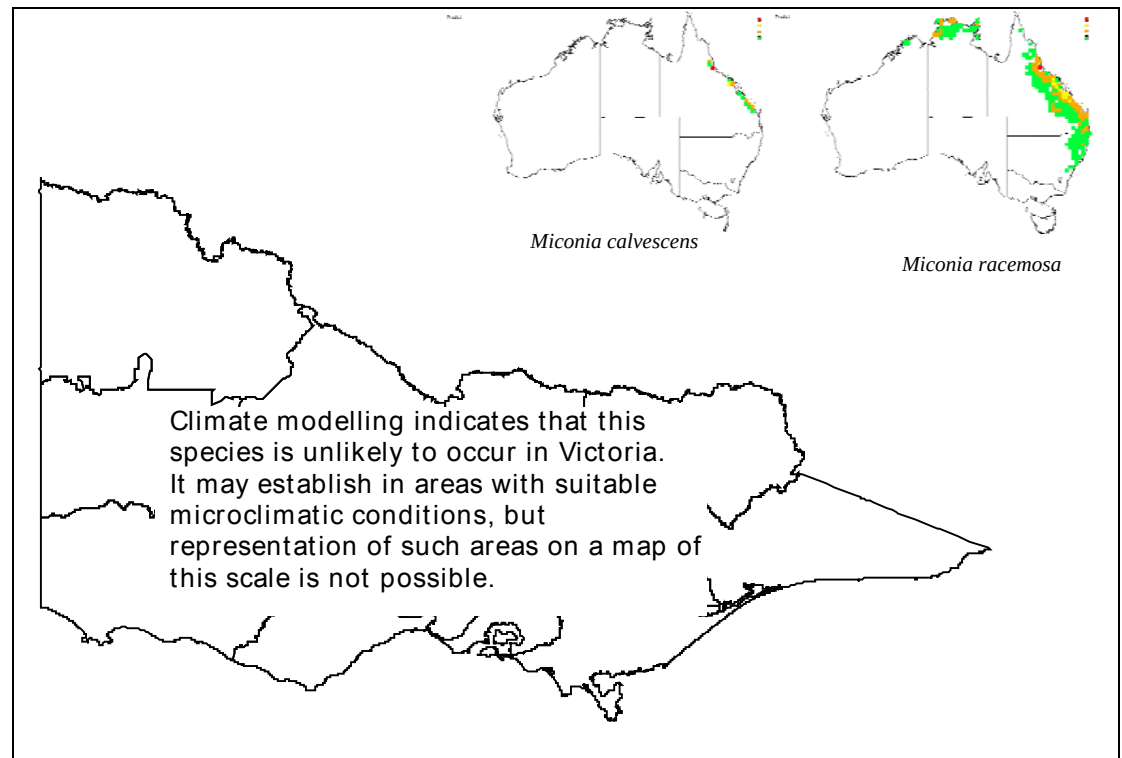
Broad vegetation types

Coastal scrubs and grassland; coastal grassy woodland; heathy woodland; heath; swamp scrub; moist foothill forest; montane moist forest; sub-alpine woodland; herb-rich woodland; riverine grassy woodland; riparian forest; mallee; mallee heath; Wimmera/mallee woodland

Colours indicate possibility of *Miconia* spp. infesting these areas.

Red	= Very high	Yellow	= High
Orange	= Medium	Green	= Likely

In the non-coloured areas the plant is unlikely to establish as the climate, soil or landuse is not presently suitable.



Impact Assessment Record

Scientific Name: Miconia spp.

Common name: miconia

QUESTION	COMMENTS	RATING	CONFIDENCE
Social			
1. Restrict human access?	‘Capable of reaching 15m in height, the majority ... are 6 to 12m tall with slender, vertical stems’ (Csurhes 1997). Forms dense monospecific stands (Csurhes 1997). In places where the weed forms dense stands, it would be a high nuisance value to both people and vehicles.	MH	H
2. Reduce tourism?	Very attractive foliage. Can reach up to 15m height and capable of forming dense, monospecific stands. Can change forest composition (Brooks 2004). Plant could affect some recreational uses.	MH	MH
3. Injurious to people?	Not documented as having injurious or toxic properties.	L	MH
4. Damage to cultural sites?	Very attractive foliage. Can reach up to 15m height and capable of forming dense, monospecific stands (Csurhes 1997). Plant would have a moderate visual effect.	ML	H
Abiotic			
5. Impact flow?	‘The hydrological properties of Miconia suggest that there may be a significant change in the water balance, with an increase in runoff and a potential reduction in groundwater recharge....Increased sedimentation will incur surface water quality damages on any infested island’ (Brooks 2004). Plant may have a minor impact on surface or subsurface flow.	ML	MH
6. Impact water quality?	‘The hydrological properties of Miconia suggest that there may be a significant change in the water balance, with an increase in runoff and a potential reduction in groundwater recharge....Increased sedimentation will incur surface water quality damages on any infested island’ (Brooks 2004). Plant may have a noticeable but minor effect on water quality.	ML	MH
7. Increase soil erosion?	‘The tentacular root system is also suspected to favour soil erosion and landslides’ (ISSG 2005). ‘Invaded slopes are prone to landslides as the weak root system does not hold the soil well and the soil lacks a herbaceous ground cover (Weber 2003). In areas of steep slopes and high rainfall, there would be a high probability of large-scale soil movement, but unlikely to occur in Victoria due to ecoclimatic limitations.	ML	MH
8. Reduce biomass?	‘Dense shade produced by the overlapping foliage of <i>M.c.</i> prevents regeneration of local rainforest plants’ (Csurhes 1997). Capable of forming dense mono-specific stands (Csurhes 1997). Biomass may increase.	L	H
9. Change fire regime?	Forms dense monospecific stands (Csurhes 1997). By preventing regeneration of the understorey, <i>Miconia</i> may have a minor change on the intensity of the fire.	ML	H
Community Habitat			
10. Impact on composition (a) high value EVC	Potential distribution of <i>Miconia</i> spp. excludes Victoria. No impact on EVCs in Victoria.	L	H
(b) medium value EVC	Potential distribution of <i>Miconia</i> spp. excludes Victoria. No impact on EVCs in Victoria.	L	H
(c) low value EVC	Potential distribution of <i>Miconia</i> spp. excludes Victoria. No impact on EVCs in Victoria.	L	H

Impact Assessment Record

Scientific Name: Miconia spp.

Common name: miconia

QUESTION	COMMENTS	RATING	CONFIDENCE
11. Impact on structure?	'The <i>M. racemosa</i> plants .. were strangling shrubs up to 3 metres tall, entangled with giant bramble along the gully floor and sides for several hundred metres' (Wilson 2002) Forms dense stands preventing regeneration of understorey. Major effect on all layers.	H	
12. Effect on threatened flora?	This species is not documented as posing an additional risk to threatened flora.	MH	L
Fauna			
13. Effect on threatened fauna?	This species is not documented as posing an additional risk to threatened fauna.	MH	L
14. Effect on non-threatened fauna?	'Changes in forest composition [due to Miconia] may threaten endangered plant species, bird species, and invertebrate species in particular' (Brooks 2004. However, due to ecoclimatic limitations, species unlikely to occur in Victoria.	L	MH
15. Benefits fauna?	Plant not documented as providing any additional benefit to fauna.	H	MH
16. Injurious to fauna?	Plant not documented as having toxic effects.	L	MH
Pest Animal			
17. Food source to pests?	Plant not documented as providing a food source to pest animals.	L	MH
18. Provides harbor?	Plant not documented as providing harbour for pest species.	L	MH
Agriculture			
19. Impact yield?	Not a weed of agriculture (ISSG 2005).	L	MH
20. Impact quality?	Not a weed of cropping (ISSG 2005).	L	MH
21. Affect land value?	Weed not known to affect land value.	L	MH
22. Change land use?	Weed not known to cause a change in priority of land use.	L	MH
23. Increase harvest costs?	Not a weed of cropping (ISSG 2005).	L	MH
24. Disease host/vector?	Not a known host or vector for disease of agriculture.	L	MH

Impact Assessment Record

Scientific Name: Miconia spp.

Common name: miconia

References cited:

- Brooks, K.A. 2004, 'Economic impacts of non-indigenous species: *Miconia* and the Hawaiian economy', *Hawaii's unsustainable development: Water, invasives and natural capital*, Gettysberg College, Washington, viewed 16 Jan 2006, http://homepage.mac.com/ondinebak/HI_Research1_files/BAKmiconia.pdf
- Csurhes, S.M. 1997, '*Miconia calvenscens*, a potentially invasive plant in Australia's tropical and sub-tropical rainforests in *Proceedings of the First Regional Conference on Miconia Control*, Papeete, August 26-29, pp. 72-77.
- Invasive Species Specialist Group 2005, *Miconia calvenscens* (tree), Global Invasive Species Database, The World Conservation Union, viewed 10 Jan 2006, <http://www.issg.org/database/species/ecology.asp?si=2&fr=1&sts=sss>
- Weber, E. 2003, *Invasive plant species of the world: A reference guide to environmental weeds*, CABI Publishing, Wallingford.
- Wilson, B. 2002, *Four weeds agenda paper*, Report to the Australian Weeds Committee, Department of Natural Resources and Mines, Queensland.

Revisions

Date	Revised by	Revision

Invasiveness Assessment Record

Scientific name: *Mimosa pigra*

Common Name: mimosa, giant sensitive plant

QUESTION	COMMENTS	RATING	CONFIDENCE
Establishment			
1. Germination requirements?	Seeds generally germinate when first wetted and have a high germination rate (ARMCANZ 2000). Opportunistic germinator.	H	MH
2. Establishment requirements?	Adapted to seasonally flooded habitats and can regenerate under some degree of canopy cover (Binggeli 1997).	MH	MH
3. How much disturbance is required?	Establishes in 'agricultural areas, coastland, disturbed areas, natural forest, planted forests, range/grasslands, riparian zones, scrub/shrublands, urban areas, water courses, wetlands' (ISSG 2005). 'Can also regenerate under a canopy of Melaleuca fringing the floodplain' (Binggeli 1997).	MH	MH
Growth/Competitive			
4. Life form?	Leguminous, thorny shrub (ARMCANZ 2000).	MH	MH
5. Allelopathic properties?	None described.	L	MH
6. Tolerates herb pressure?	Impalatable to mammalian herbivores but biological control agents (insect and fungal) are being used (ARMCANZ 2000). <i>Neurostrotta gunniella</i> , particularly, has been found to stunt plants but insufficient to control the plant (Paynter 2002).	MH	H
7. Normal growth rate?	Smothers pastures and has densely covered river floodplain and swamp forest with monospecific thickets (ISSG 2005). Although seedlings are susceptible to competition from native grasses, once established will generally out-compete most flood plain species (Marko 1999).	H	MH
8. Stress tolerance to frost, drought, w/logg, sal. etc?	Can survive up to seven months drought. Can withstand flooding. Fire resistant and fire alone may stimulate re-growth and enhance seed germination. Tolerant to saline conditions. (Marko 1999)	H	MH
Reproduction			
9. Reproductive system	Assumed that most of the seeds are produced by autogamy in Australia but is also bee-pollinated and possibly wind pollinated (ISSG 2005). Does not naturally reproduce vegetatively but can do from cut stems (Parsons & Cuthbertson 2001).	ML	MH
10. Number of propagules produced?	Average production is 9000 seeds per square metre (ARMCANZ 2000). Per plant, production has been measured at up to 220,000 (ISSG 2005).	H	MH
11. Propagule longevity?	On sandy soils, seeds can survive at least 23 years, but viability will decrease more rapidly on clay soils (ARMCANZ 2000).	H	MH
12. Reproductive period?	Flowering will continue for as long as water is available. Species can form dense monocultures (ISSG 2005).	H	MH
13. Time to reproductive maturity?	Plants can begin flowering from 6 to 8 months after germination under ideal conditions (ARMCANZ 2000).	H	MH

Invasiveness Assessment Record

Scientific name: *Mimosa pigra*

Common Name: mimosa, giant sensitive plant

QUESTION	COMMENTS	RATING	CONFIDENCE
Dispersal			
14. Number of mechanisms?	Bristles covering the seed pods assist in water dispersal. Within catchments, spread by floodwaters. Also spread by vehicle movement and by animals (buffalo, cattle, horses, wallabies). Seeds can stick on magpie geese and other waders (ISSG 2005).	H	MH
15. How far do they disperse?	Due to the mechanisms of dispersal, it is assumed that seeds can spread over 1km.	H	MH

References cited:

- Agriculture & Resource Management Council of Australia & New Zealand, Australian & New Zealand Environment & Conservation Council and Forestry Ministers 2000, *Weeds of National Significance: mimosa (Mimosa pigra): strategic plan*, National weeds Strategy Executive Committee, Launceston, viewed: 27 October 2005, <http://www.weeds.org.au/docs/mimstrat.pdf>
- Binggelli, P 1997, *Mimosa pigra* L. (Mimosaceae), Woody Plant Ecology, viewed: 28 October 2005, <http://members.lycos.co.uk/WoodyPlantEcology/docs/web-sp11.htm>
- Invasive Species Specialist Group 2005, *Global invasive species database: Mimosa pigra (shrub)*, Invasive Species Specialist Group, Auckland, viewed: 28 July 2005, <http://www.issg.org/database/species/ecology.asp?si=41&fr=1&sts=sss>
- Marko M 1999, Controlling invasion of the exotic shrub (Mimosa pigra) in tropical Australian wetlands, *Restoration and Reclamation Review*, vol. 4, University of Minnesota, viewed: 27 October 2005, <http://horticulture.coafes.umn.edu/vd/h5015/99papers/marko.htm>
- Parsons, W T & Cuthbertson, E G 2001, *Noxious weeds of Australia*, 2nd ed., CSIRO Publishing, Collingwood.
- Paynter, Q 2002, 'Integrated weed management: effect of herbicide choice and timing of application on the survival of biological control agent of the tropical wetland weed, Mimosa pigra', *Biological Control*, vol. 26, no. 2, pp. 162-167.

Revisions

Date Revised by Revision

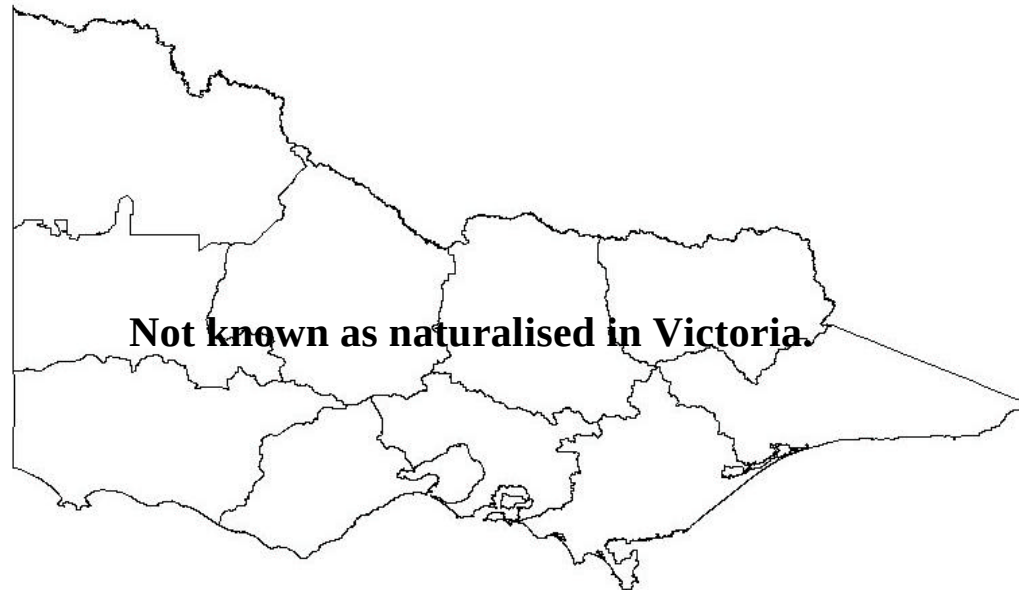
Present distribution of *Mimosa pigra* in Victoria

Scientific name: *Mimosa pigra* L.

Common name(s): mimosa, giant sensitive plant

Status:

Habitat: Favours wet-dry tropical climate with annual rainfall between 750 and 2250 mm. Found most commonly in floodplains and riverbanks within soils ranging from black cracking clays to sandy clays to coarse siliceous sand although does not appear to grow preferentially in any soil type. Occurs in agricultural areas, coastland, disturbed areas, natural forest, planted forests, range/grasslands, riparian zones, scrub/shrublands, urban areas, water courses, wetlands. (ISSG 2005). Wet places in the humid and subhumid tropics, occurring as a weed of roadsides, watercourses, drainage ditches, reservoirs, seasonally flooded wetlands, lowland fields and occasionally tropical mountain valleys (Parsons & Cuthbertson 2001).
soil or landuse is not presently suitable.



Potential distribution of *Mimosa pigra* in Victoria

Scientific name: *Mimosa pigra* L.

Common name(s): mimosa, giant sensitive plant

Status:

Habitat: Favours wet-dry tropical climate with annual rainfall between 750 and 2250 mm. Found most commonly in floodplains and riverbanks within soils ranging from black cracking clays to sandy clays to coarse siliceous sand although does not appear to grow preferentially in any soil type. Occurs in agricultural areas, coastland, disturbed areas, natural forest, planted forests, range/grasslands, riparian zones, scrub/shrublands, urban areas, water courses, wetlands. (ISSG 2005). Wet places in the humid and subhumid tropics, occurring as a weed of roadsides, watercourses, drainage ditches, reservoirs, seasonally flooded wetlands, lowland fields and occasionally tropical mountain valleys (Parsons & Cuthbertson 2001).

Potential distribution produced from CLIMATE modelling refined by applying suitable landuse and vegetation type overlays with CMA boundaries

MAP OVERLAYS USED.

Land Use:

Broadacre cropping
Forest private / forest public plantation
Pasture dryland / irrigation

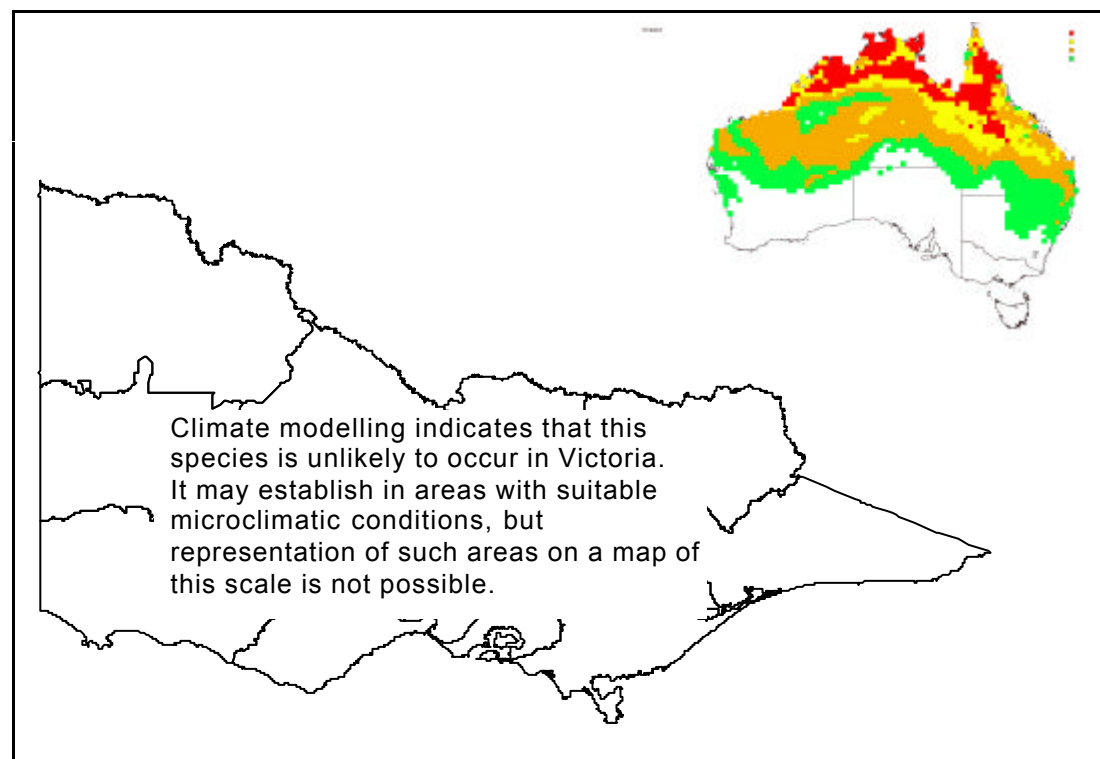
Broad vegetation types

Coastal scrubs and grassland; coastal grassy woodland; heathy woodland; lowland forest; heath; swamp scrub; moist foothill forest; valley grassy forest; riverine grassy woodland; riparian forest; mallee heath

Colours indicate possibility of *Mimosa pigra* infesting these areas.

 Red	= Very high	 Yellow	= High
 Orange	= Medium	 Green	= Likely

In the non-coloured areas the plant is unlikely to establish as the climate, soil or landuse is not presently suitable.



Impact Assessment Record

Scientific Name: *Mimosa pigra*

Common name: mimosa

QUESTION	COMMENTS	RATING	CONFIDENCE
Social			
1. Restrict human access?	"This aggressive prickly shrub forms impenetrable thickets 4 to 5 metres high, making infested areas inaccessible to man" (Parsons & Cuthbertson 2001). "Traditional hunting areas have been choked by mimosa, so that people can no longer hunt [in some Aboriginal communities in NT]' (CRC for Weed Management 2005). Dense infestations would create a major impediment to humans.	H	MH
2. Reduce tourism?	Infestations of <i>M. pigra</i> create, "...perceptions of degraded natural landscapes; reduced wildlife attractions; reduced area and access for tourism activities; reduced access to fishing, hunting and scenic areas" (ARMCANZ 2001). Dense infestations would have serious implications for recreational activities.	H	MH
3. Injurious to people?	"Stems are armed with broad-base prickles to 7 mm long" (Groves <i>et al</i> 1995). Prickles exist throughout the year. Potential for minor injury.	MH	MH
4. Damage to cultural sites?	"...perceptions of degraded natural landscapes; reduced wildlife attractions; reduced area and access for tourism activities; reduced access to fishing, hunting and scenic areas" (ARMCANZ 2001). Infestations would create a moderate visual effect.	ML	MH
Abiotic			
5. Impact flow?	Terrestrial species invading, "...sedgeland and grassland communities on open floodplains" (Groves <i>et al</i> 1995).	L	MH
6. Impact water quality?	Terrestrial species.	L	MH
7. Increase soil erosion?	"A large central taproot penetrate 1 – 2 m into the soil, together with a lateral root system that extends up to 3.5 m from the stem" (Groves <i>et al</i> 1995). Unlikely to contribute to soil erosion.	L	MH
8. Reduce biomass?	The plant invades, "...sedgeland and grassland communities on open floodplains," and can grow to a height of 6 m (Groves <i>et al</i> 1995). Biomass would increase.	L	MH
9. Change fire regime?	Mimosa is fire resistant (Marko 1999). In dense infestations, it would decrease horizontal continuity, thereby decreasing fire frequency and extent (Brooks <i>et al</i> 2004). Minor change to frequency of fire.	ML	H
Community Habitat			
10. Impact on composition (a) high value EVC	Climate modelling predicts that this species is not likely to establish as a weedy species in Victoria. No impact on EVCs in Victoria.	L	H
(b) medium value EVC	Climate modelling predicts that this species is not likely to establish as a weedy species in Victoria. No impact on EVCs in Victoria.	L	H
(c) low value EVC	Climate modelling predicts that this species is not likely to establish as a weedy species in Victoria. No impact on EVCs in Victoria.	L	H
11. Impact on structure?	"In Australia, a largely intact natural landscape has been completely altered. Some 450 km ² of floodplain and swamp forest have been covered by dense monospecific stands of <i>M. pigra</i> which have little understorey except for seedlings and suckers of <i>M. pigra</i> " (Groves <i>et al</i> 1995).	H	MH

Impact Assessment Record

Scientific Name: *Mimosa pigra*

Common name: mimosa

QUESTION	COMMENTS	RATING	CONFIDENCE
12. Effect on threatened flora?	The potential for <i>M. pigra</i> to establish and naturalise in Victoria is highly unlikely due to ecoclimatic limitations. No impact on threatened flora in Victoria.	L	MH
Fauna			
13. Effect on threatened fauna?	The potential for <i>M. pigra</i> to establish and naturalise in Victoria is highly unlikely due to ecoclimatic limitations. No impact on threatened fauna in Victoria.	L	MH
14. Effect on non-threatened fauna?	"Braithwaite <i>et al.</i> (1989) found that <i>M. pigra</i> thickets had fewer birds and lizards" (Groves <i>et al</i> 1995). Reduces habitat for fauna species.	MH	MH
15. Benefits fauna?	"...the rare marsupial mouse <i>Sminthopsis virginiae</i> (Tarragon) has become more abundant as a result of <i>M. pigra</i> . It probably shelters from predators in the dense thickets" (Groves <i>et al</i> 1995). Provides some assistance to desirable species.	MH	MH
16. Injurious to fauna?	Not documented as causing injury. Not toxic.	L	MH
Pest Animal			
17. Food source to pests?	Not known as a food source to pest animals.	L	MH
18. Provides harbor?	Not known to provide harbor to pest animals.	L	MH
Agriculture			
19. Impact yield?	"Occurring, as it does, in damp situations along riverbanks and billabongs, mimosa interferes with stock watering, [and] irrigation projects. It also moves out onto the drier floodplains away from rivers, where it smothers pastures, [and] reduces the available grazing area" (Parsons & Cuthbertson 2001). "The rate of population increase in river systems is rapid, with infestations able to double in area every 1.2 years" (Groves <i>et al</i> 1995). Major impact on carrying capacity.	MH	MH
20. Impact quality?	Not known to affect quality of produce.	L	MH
21. Affect land value?	Primarily a weed of natural ecosystems, in the Northern Territory, it does occur on grazing land (ARMCANZ 2001). As an aggressive shrub that can spread rapidly reducing grazing and water resources, land prices may be somewhat affected.	M	MH
22. Change land use?	"If mimosa continues to spread, large stands could develop very quickly in pastoral and agricultural areas of eastern Queensland and in the Ord River region of Western Australia. The cost of mimosa control under these circumstances would be exorbitant" (ARMCANZ 2001). Land use may be seriously affected.	H	MH
23. Increase harvest costs?	Infestations make stock management and mustering difficult. Increase in time and labour to harvest animals (ARMCANZ 2001).	M	MH
24. Disease host/vector?	None evident	L	MH

Impact Assessment Record

Scientific Name: *Mimosa pigra*

Common name: mimosa

References cited:

- Agriculture and Resource Management Council of Australia & New Zealand, Australian & New Zealand Environment & Conservation Council and Forestry Ministers, (2001) *Weeds of National Significance Mimosa (*Mimosa pigra*) Strategic Plan*. National Weeds Strategy Executive Committee, Launceston.
- Brooks, M.L., D'Antonio, C.M., Richardson, D.M., Grace, J.B., Keeley, J.E., DiTomaso, J.M., Hobbs, R.J., Pellant, M. & Pyke, D. 2004, 'Effects of invasive alien plants on fire regimes', *BioScience*, vol. 54, no. 7, pp. 677-688.
- CRC for Weed Management (2005), *Indigenous weed warriors join the fight*, Press release, Cooperative Research Centre for Australian Weed Management, November 18.
- Groves, R. H., Shepherd R.C.H. & Richardson, R.G. (eds) (1995) *The Biology of Australian Weeds Vol* , R.G and F.J.Richardson Publications, Melbourne.
- Marko, M (1999) Controlling invasion of the exotic shrub (*Mimosa pigra*) in tropical Australian wetlands. In; *Restoration & Reclamation Review, Vol 4 – Spring 1999: International Restoration Efforts*. University of Minnesota. Available: <http://www.hort.agri.umn.edu/h5015/rrr.htm> Accessed 14/07/03.
- Parsons, W.T. & Cuthbertson, E.G. (2001) *Noxious weeds of Australia*, 2nd edn, CSIRO publishing, Collingwood.
- Thorp, JR & Lynch, R (2000) *The Determination of Weeds of National Significance*. National Weeds Strategy Executive Committee, Launceston.

Revisions

Date	Revised by	Revision

Invasiveness Assessment Record

Scientific name: *Onopordum dissectum* Willd.

Common Name: thistle

QUESTION	COMMENTS	RATING	CONFIDENCE
Establishment			
1. Germination requirements?	“Plants typically germinate in fall [autumn] after first rains” (Healy, Enloe & DiTomaso, 2005).	MH	MH
2. Establishment requirements?	Most species grow in rocky or stony ground, roadsides, waste places and similar dry, open habitats (Tutin, 1993). <i>Onopordum</i> in general grow along roadsides and in fields (Healy, Enloe & DiTomaso, 2005). Requires open space.	ML	MH
3. How much disturbance is required?	Most species grow in rocky or stony ground, roadsides, waste places and similar dry, open habitats (Tutin, 1993). <i>Onopordum</i> in general grow along roadsides and in fields (Healy, Enloe & DiTomaso, 2005). Establishes in highly disturbed ecosystems.	ML	MH
Growth/Competitive			
4. Life form?	Biennial (Tutin, 1993).	L	MH
5. Allelopathic properties?	No information found	M	L
6. Tolerates herb pressure?	For all <i>Onopordum</i> , stems spinose-winged, or absent...involucral bracts spine-tipped (Tutin, 1993). Spines on the inflorescence (and probably the stems) would deter herbivory by vertebrates.	MH	MH
7. Normal growth rate?	No information found	M	L
8. Stress tolerance to frost, drought, w/logg, sal. etc?	Grows in deep dry soils in Spain and Portugal (Rivas-Martinez et al, 2002). No further information found about stress tolerances.	M	L
Reproduction			
9. Reproductive system	<i>Onopordum</i> reproduce only by seeds (Healy et al, 2005). No further information found.	ML	L
10. Number of propagules produced?	Average of 218 capitula per plant (Briese et al, 1995).No further information found.	M	L
11. Propagule longevity?	No information found	M	L
12. Reproductive period?	“Flowering stems develop during the second spring/summer season” (Healy, Enloe & DiTomaso, 2005) on this biennial plant (Tutin, 1993), so that they produce seed for only one year.	L	MH
13. Time to reproductive maturity?	Biennial (Tutin, 1993). “Flowering stems develop during the second spring/summer season” (Healy, Enloe & DiTomaso, 2005), within two years of germinating.	MH	MH
Dispersal			
14. Number of mechanisms?	No information found.	M	L

Invasiveness Assessment Record

Scientific name: *Onopordum dissectum* Willd.

Common Name: thistle

QUESTION	COMMENTS	RATING	CONFIDENCE
15. How far do they disperse?	No information found.	M	L

References cited:

Briese DT, Sheppard AW & Reifenberg JM 1995, Open-field host-specificity testing for potential biological control agents of *Onopordum* thistles,' *Biological Control*, Vol. 5, p. 158-166.

Healy, EA, Enloe, S & JMDiTomaso 2005, *California Department of Food and Agriculture*, USA, viewed: 06/12/2005, <http://www.cdfa.ca.gov/phpps/ipc/weedinfo/onopordum.htm>

Rivas-Martinez S, dias T E Fernandex-Gonzalez F, Izco J, Loidi J, Lousa M & Penas A 2002. 'Vascular plant communities of spain and portugal addenda to the syntaxonomical checklist of 2001,' *Itinera Geobotanica*, vol 15(1-2), pp. 5-922.

Tutin TG 1993, *Flora Europaea*, University Press, Cambridge.

Revisions

Date	Revised by	Revision

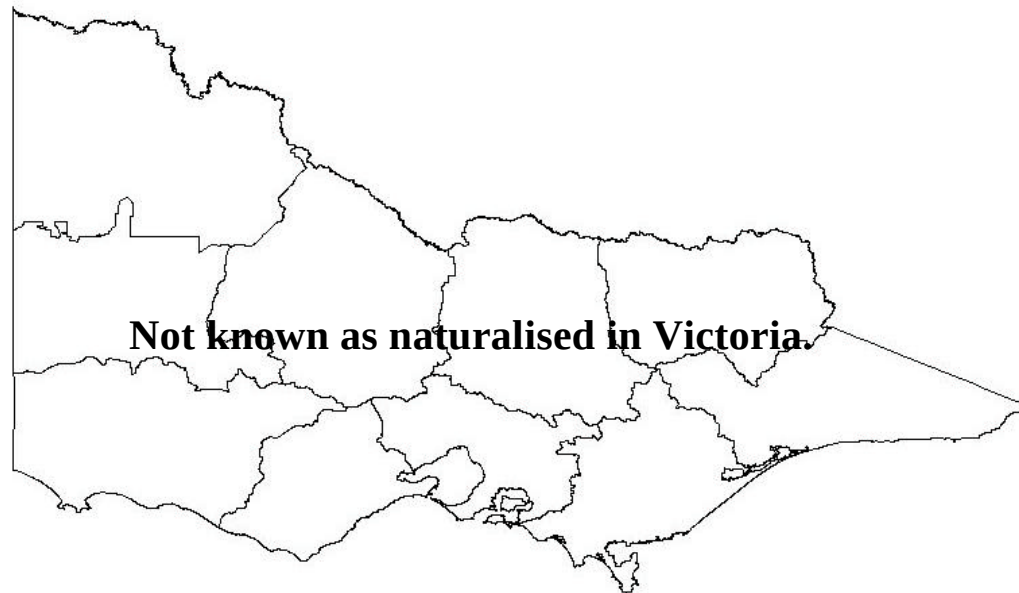
Present distribution of *Onopordum dissectum* in Victoria

Scientific name: *Onopordum dissectum* Murb.

Common name(s): thistle

Status:

Habitat:



Potential distribution of *Onopordum dissectum* in Victoria

Scientific name: *Onopordum dissectum* Murb.

Common name(s): thistle

Status:

Habitat:

Potential distribution produced from CLIMATE modelling refined by applying suitable landuse and vegetation type overlays with CMA boundaries

MAP OVERLAYS USED.

Land Use:

Broad vegetation types

Colours indicate possibility of *Onopordum* spp. infesting these areas.

 Red	= Very high	 Yellow	= High
 Orange	= Medium	 Green	= Likely

In the non-coloured areas the plant is unlikely to establish as the climate, soil or landuse is not presently suitable.

Insufficient information available to
produce potential distribution map for
Onopordum dissectum

Impact Assessment Record

Scientific Name: *Onopordum dissectum* Mub.

Common name: thistle

QUESTION	COMMENTS	RATING	CONFIDENCE
Social			
1. Restrict human access?	No information about the morphology of this plant was found.	M	L
2. Reduce tourism?	No information about the morphology of this plant was found.	M	L
3. Injurious to people?	For all <i>Onopordum</i> , stems spinose-winged, or absent...involucral bracts spine-tipped (Tutin, 1980). Spines on the inflorescence (and probably the stems) may cause some damage at most times of the year.	MH	MH
4. Damage to cultural sites?	No information about the morphology of this plant was found.	M	L
Abiotic			
5. Impact flow?	Most species grow in rocky or stony ground, roadsides, waste places and similar dry, open habitats (Tutin, 1980). Terrestrial species.	L	MH
6. Impact water quality?	Most species grow in rocky or stony ground, roadsides, waste places and similar dry, open habitats (Tutin, 1980). Terrestrial species.	L	MH
7. Increase soil erosion?	Biennial species (Tutin, 1980) that may leave large bare patches after it dies off, however the extent of infestations is unknown.	M	L
8. Reduce biomass?	No information about the morphology of this plant was found.	M	L
9. Change fire regime?	No information about the morphology of this plant was found.	M	L
Community Habitat			
10. Impact on composition (a) high value EVC	No information about the morphology and invasiveness of this plant was found.	M	L
(b) medium value EVC	No information about the morphology and invasiveness of this plant was found.	M	L
(c) low value EVC	No information about the morphology and invasiveness of this plant was found.	M	L
11. Impact on structure?	No information about the morphology and invasiveness of this plant was found.	M	L
12. Effect on threatened flora?	No information found.	MH	L

Impact Assessment Record

Scientific Name: *Onopordum dissectum* Mub.

Common name: thistle

QUESTION	COMMENTS	RATING	CONFIDENCE
Fauna			
13. Effect on threatened fauna?	No information found.	MH	L
14. Effect on non-threatened fauna?	No information about the morphology and invasiveness of this plant was found.	M	L
15. Benefits fauna?	No information about the morphology and invasiveness of this plant was found.	M	L
16. Injurious to fauna?	For all <i>Onopordum</i> , stems spinose-winged, or absent...involucral bracts spine-tipped (Tutin, 1980). Spines on the inflorescence (and probably the stems) may cause some damage at most times of the year.	MH	MH
Pest Animal			
17. Food source to pests?	For all <i>Onopordum</i> , stems spinose-winged, or absent...involucral bracts spine-tipped (Tutin, 1980). Spines on the inflorescence (and probably the stems) would deter herbivory by vertebrate species.	L	MH
18. Provides harbor?	No information about the morphology of this plant was found.	M	L
Agriculture			
19. Impact yield?	No information about the morphology and invasiveness of this plant was found.	M	L
20. Impact quality?	No information about the morphology and invasiveness of this plant was found.	M	L
21. Affect land value?	No information about the morphology and invasiveness of this plant was found.	M	L
22. Change land use?	No information about the morphology and invasiveness of this plant was found.	M	L
23. Increase harvest costs?	No information about the morphology and invasiveness of this plant was found.	M	L
24. Disease host/vector?	No information about disease host/vector of this plant was found, however there was very little information available about this species.	M	L

References cited:

Briese DT, Sheppard AW & Reifenberg JM 1995, Open-field host-specificity testing for potential biological control agents of *Onopordum* thistles,' *Biological Control*, Vol. 5, p. 158-166.

Healy, EA, Enloe, S & JM DiTomaso 2005, *California Department of Food and Agriculture*, USA, viewed: 06/12/2005, <http://www.cdfa.ca.gov/phpps/ipc/weedinfo/onopordum.htm>.

Impact Assessment Record

Scientific Name: *Onopordum dissectum* Mub.

Common name: thistle

Rivas-Martinez S, Dias T E, Fernandex-Gonzalez F, Izco J, Loidi J, Lousa M & Penas A 2002. 'Vascular plant communities of Spain and Portugal addenda to the syntaxonomical checklist of 2001,' *Itinera Geobotanica*, vol 15(1-2), pp. 5-922.

Tutin TG 1993, *Flora Europaea*, University Press, Cambridge

Revisions

Date	Revised by	Revision

Invasiveness Assessment Record

Scientific name: *Onopordum nervosum* Boiss.

Common Name: cotton thistle

QUESTION	COMMENTS	RATING	CONFIDENCE
Establishment			
1. Germination requirements?	Its vegetative cycle starts in Autumn (Manzanares et al, 1993). Requires natural seasonal disturbances.	MH	H
2. Establishment requirements?	Grows in rocky or stony ground, roadsides, waste places and similar dry, open habitats (Tutin, 1980). Requires open space to establish.	MH	MH
3. How much disturbance is required?	Grows in rocky or stony ground, roadsides, waste places and similar dry, open habitats (Tutin, 1980). Establishes in highly disturbed ecosystems.	ML	MH
Growth/Competitive			
4. Life form?	Biennial (Tutin, 1980).	L	MH
5. Allelopathic properties?	None found, but there is very little information about this species.	M	L
6. Tolerates herb pressure?	Leaves and stems bear spines up to 1 cm long (Tutin, 1980), which would deter most vertebrates, except perhaps for goats who eat the seed heads of the related <i>O. illyricum</i> (Holst & Allan, 1996). Weevils were introduced to Australia to control this genus in 1992, but it was found that less than 20% of <i>O. tauricum</i> capitula were attacked (Briese, 2000). These thistles are still capable of seed production under most herbivory pressure.	MH	MH
7. Normal growth rate?	No information found	M	L
8. Stress tolerance to frost, drought, w/logg, sal. etc?	Grows in dry habitats (Tutin, 1980). No further information about tolerances found.	M	L
Reproduction			
9. Reproductive system	<i>Onopordum</i> reproduce only by seeds (Healy, Enloe & DiTomaso, 2005). No further information found.	M	L
10. Number of propagules produced?	Average of 218 capitula per plant (Briese et al, 1995). Each capitulum appears composed of over 100 florets (see picture in ENG, 2002). $218 \times 100 = 21\ 800$.	H	ML
11. Propagule longevity?	"Buried seed [of <i>Onopordum</i> spp.] may persist for up to twenty years" (Healy, Enloe & DiTomaso, 2005). Deep dormancy has been observed in <i>O. nervosum</i> seeds (Perez-Garcia & Duran, 1990).	H	H
12. Reproductive period?	Biannual plant. Its vegetative cycle starts in Autumn...ending the cycle in summer with flowering and fructification (Manzanares et al, 1993). Produces propagules for more than one year but less than two.	ML	H
13. Time to reproductive maturity?	Its vegetative cycle starts in Autumn...ending the cycle in summer with flowering and fructification (Manzanares et al, 1993). Produces seed in less than one year.	H	H
Dispersal			
14. Number of mechanisms?	No information found.	M	L

Invasiveness Assessment Record

Scientific name: *Onopordum nervosum* Boiss.

Common Name: cotton thistle

QUESTION	COMMENTS	RATING	CONFIDENCE
15. How far do they disperse?	No information found.	M	L

References cited:

- Briese, DG 2000, 'Impact of the *Onopordum capitulum* seedling *Levinus latus* on seed production by its host-plant,' *Journal of Applied Ecology*, vol. 37, pp. 238-246.
- Briese DT, Sheppard AW & Reifenberg JM 1995, Open-field host-specificity testing for potential biological control agents of *Onopordum* thistles,' *Biological Control*, Vol. 5, p. 158-166.
- Espacia Natural – Galeria (ENG) 2002, *Espacio Natural*, Spain, viewed: 07/03/2006, www.esapionatural.com/4images/img1598.htm
- Healy, EA, Enloe, S & JMDiTomaso 2005, *California Department of Food and Agriculture*, USA, viewed: 06/12/2005, <http://www.cdfa.ca.gov/phpps/ipc/weedinfo/onopordum.htm>
- Holst PJ & Allan CJ 1996, 'Targetted grazing of thistles using sheep and goats,' *Plant Protection Quarterly*, vol. 11(supplement 2), pp. 271-273.
- Manzanares P, Negro MJ, Saez R & Martin C 1993 'Onopordum nervosum as biomass source: some aspects of its production and transformation by enzymatic hydrolysis,' *Bioresource Technology*, vol. 44, p. 95-99.
- Perez-Garcia F & Duran JM 1990, 'The effect of gibberelic acid on germination of *Onopordum nervosum* Boiss. seeds,' *Seed Science and Technology*, vol. 18, p. 83-88.
- Tutin, TG (ed) 1980, *Flora Europaea*, University Press, Cambridge.

Revisions

Date Revised by Revision

Present distribution of *Onopordum nervosum* in Victoria

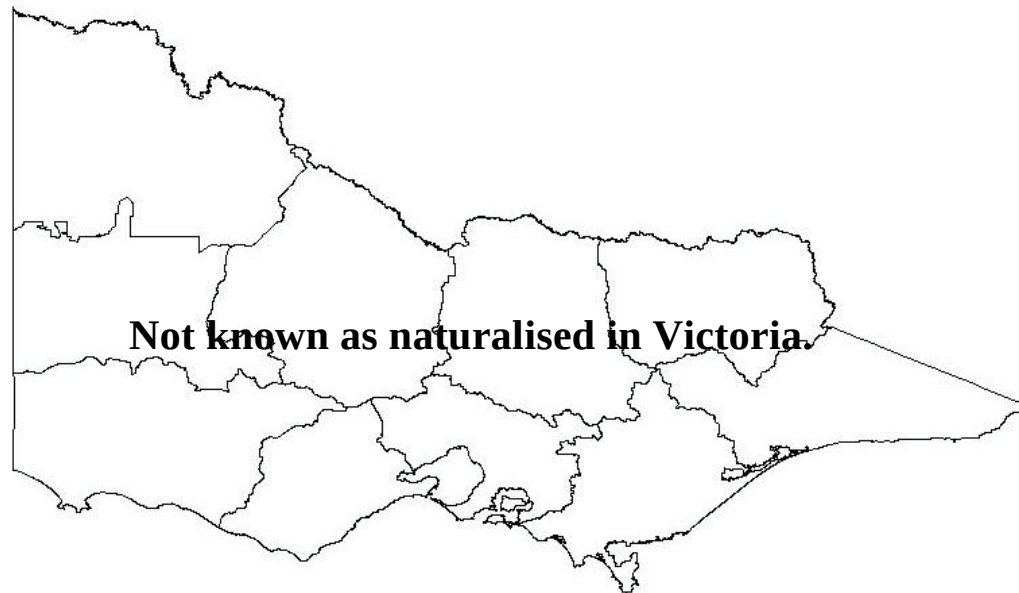
Scientific name: *Onopordum nervosum* Boiss.

Common name(s): Cotton thistle

Status:

Habitat:

Native to Spain. Found mainly in lime soils (Manzaranares *et al* 1993). Most species grow in rocky or stony ground, roadsides, waste places and similar dry, open habitats (Tutin, 1980).



Potential distribution of *Onopordum nervosum* in Victoria

Scientific name: *Onopordum nervosum* Boiss.

Common name(s): Cotton thistle

Status:

Habitat:

Native to Spain. Found mainly in lime soils (Manzananares *et al* 1993). Most species grow in rocky or stony ground, roadsides, waste places and similar dry, open habitats (Tutin, 1980).

Potential distribution produced from CLIMATE modelling refined by applying suitable landuse and vegetation type overlays with CMA boundaries

MAP OVERLAYS USED.

Land Use:

Horticulture; pasture dryland

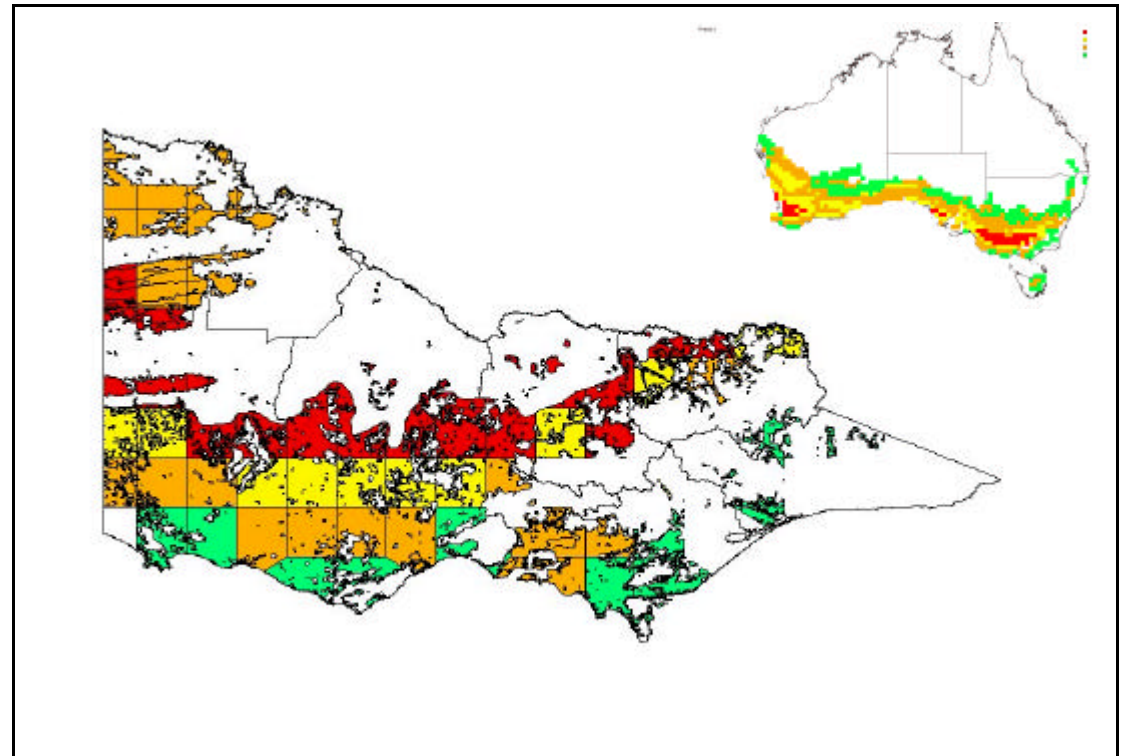
Broad vegetation types

Coastal scrubs and grassland; coastal grassy woodland; heathy woodland; heath; inland slopes woodland; grassland; plains grassy woodland; herb-rich woodland; mallee; mallee heath

Colours indicate possibility of *Onopordum nervosum* infesting these areas.

Red	= Very high	Yellow	= High
Orange	= Medium	Green	= Likely

In the non-coloured areas the plant is unlikely to establish as the climate, soil or landuse is not presently suitable.



Impact Assessment Record

Scientific Name: *Onopordum nervosum* Boiss.

Common name: cotton thistle

QUESTION	COMMENTS	RATING	CONFIDENCE
Social			
1. Restrict human access?	No information about the extent of infestations of this plant was found.	M	L
2. Reduce tourism?	Flowers purplish-pink on thorny plants (ENG, 2002) up to 2.7 m (Tutin, 1980) are likely to be very obvious to the average visitor and have a moderate visual effect. The density of infestations is not known so more serious impacts may be possible, but are not known.	M	L
3. Injurious to people?	The stems are spinose-winged, ...and the involucre bracts spine-tipped (Tutin, 1980; ENG, 2002). Spines on the inflorescence stems may cause some damage at most times of the year.	MH	MH
4. Damage to cultural sites?	Flowers purplish-pink on thorny plants (ENG, 2002) up to 2.7 m (Tutin, 1980) are likely to be very obvious to the average visitor and have a moderate visual effect.	ML	ML
Abiotic			
5. Impact flow?	Most species grow in rocky or stony ground, roadsides, waste places and similar dry, open habitats (Tutin, 1980). Terrestrial species.	L	MH
6. Impact water quality?	Most species grow in rocky or stony ground, roadsides, waste places and similar dry, open habitats (Tutin, 1980). Terrestrial species.	L	MH
7. Increase soil erosion?	Biennial species (Tutin, 1980) that may leave large bare patches after it dies off, however the extent of infestations is unknown.	M	L
8. Reduce biomass?	Invades rocky or stony ground, roadsides, waste places and similar dry, open habitats (Tutin, 1980). In this type of vegetation, the plant is likely to replace other herbaceous species.	ML	H
9. Change fire regime?	Post senescence “stems can persist into the next season with spiny phyllaries and receptacles attached” (Healy, Enroe & DiTomaso, 2005). In dry, open habitats, where this plant invades (Tutin, 1980) this dried vegetation adds to the fuel load, most likely causing a moderate increase in the intensity of fires.	MH	MH
Community Habitat			
10. Impact on composition (a) high value EVC	EVC=Plains grassland (BCS = E) CMA=Mallee; Bioreg=Lowan Mallee; CLIMATE potential=VH. Species has potential to occur in high value EVC although impact on composition unknown. Score medium.	M	L
(b) medium value EVC	EVC=Chenopod grassland (BCS = D) CMA=Mallee; Bioreg=Lowan Mallee; CLIMATE potential=VH. Species has potential to occur in medium value EVC although impact on composition unknown. Score medium.	M	L
(c) low value EVC	EVC=Dunefield heathland (BCS = C) CMA=Mallee; Bioreg=Lowan Mallee; CLIMATE potential=VH. Species has potential to occur in low value EVC although impact on composition unknown. Score medium.	M	L
11. Impact on structure?	No information was found about the density of infestations.	M	L

Impact Assessment Record

Scientific Name: *Onopordum nervosum* Boiss.

Common name: cotton thistle

QUESTION	COMMENTS	RATING	CONFIDENCE
12. Effect on threatened flora?	No information found.	MH	L
Fauna			
13. Effect on threatened fauna?	No information found.	MH	L
14. Effect on non-threatened fauna?	No information found.	MH	L
15. Benefits fauna?	The structure of this spiny plant (as seen in BBG, 2006) is unlikely to provide harbour or food to desirable fauna species.	H	ML
16. Injurious to fauna?	The stems are spinose-winged...and the involucre bracts spine-tipped (Tutin, 1980). Spines on the inflorescence and stems may cause some damage at most times of the year.	MH	MH
Pest Animal			
17. Food source to pests?	The stems are spinose-winged...and the involucre bracts spine-tipped (Tutin, 1980). Spines on the inflorescence and stems would deter herbivory by vertebrate species.	L	MH
18. Provides harbor?	The structure of this spiny plant (as seen in BBG, 2006) is unlikely to provide harbour to pest animals.	L	ML
Agriculture			
19. Impact yield?	No information about the invasiveness of this plant was found.	M	L
20. Impact quality?	No information about the invasiveness of this plant was found.	M	L
21. Affect land value?	No information about the invasiveness of this plant was found.	M	L
22. Change land use?	No information about the invasiveness of this plant was found.	M	L
23. Increase harvest costs?	No information about the invasiveness of this plant was found.	M	L
24. Disease host/vector?	No information about disease host/vector of this plant was found, however there was very little information available about this species.	M	L

Impact Assessment Record

Scientific Name: *Onopordum nervosum* Boiss.

Common name: cotton thistle

References cited:

Briese DT, Sheppard AW & Reifenberg JM 1995, Open-field host-specificity testing for potential biological control agents of *Onopordum* thistles,' *Biological Control*, Vol. 5, p. 158-166.

Bishop Burton Gardens (BBG) 2003, *bishop Burton Gardens – Plant Selection*, Bishop Burton Gardens Agricultural College, UK, viewed 07/03/2006, <http://class.bishopb-college.ac.uk/hortic>.

Espacia Natural – Galeria (ENG) 2002, *Espacio Natural*, Spain, viewed: 07/03/2006, www.esapionatural.com/4images/img1598.htm

Healy, EA, Enloe, S & JM DiTomaso 2005, *California Department of Food and Agriculture*, USA, viewed: 06/12/2005, <http://www.cdffa.ca.gov/phpps/ipc/weedinfo/onopordum.htm>.

Tutin TG 1980, *Flora Europaea*, University Press, Cambridge

Revisions

Date	Revised by	Revision

Invasiveness Assessment Record

Scientific name: *Onopordum tauricum* Willd.

Common Name: Taurian thistle

QUESTION	COMMENTS	RATING	CONFIDENCE
Establishment			
1. Germination requirements?	“Plants typically germinate in fall [autumn] after first rains” (Healy, Enloe & DiTomaso, 2005).	MH	MH
2. Establishment requirements?	“Seedlings do not compete well with established perennial grasses” (Healy, Enloe & DiTomaso, 2005). Requires open space to establish.	ML	MH
3. How much disturbance is required?	Invades pasture, roadsides and waste places (Groves et. al, 2002), steppe, open scrub and fallow fields (Davis, 1975), drainage creeks (MCA, 2006). Establishes in highly disturbed ecosystems.	ML	H
Growth/Competitive			
4. Life form?	“Tall biennial thistle” (Groves, et. al, 2002) up to 2 m (Tutin, 1980).	L	MH
5. Allelopathic properties?	None found, but there is little information about the biology of this species.	M	L
6. Tolerates herb pressure?	Leaves and stems bear spines up to 1.5 cm long (Davis, 1975), which seems to deter most vertebrates, except perhaps for goats who eat the seed heads of the related <i>O. illyricum</i> (Holst & Allan, 1996). Weevils were introduced to Australia to control this genus in 1992, but it was found that less than 20% of <i>O. tauricum</i> capitula were attacked (Briese, 2000). Taurian thistles are still capable of seed production under most herbivory pressure.	MH	MH
7. Normal growth rate?	Vigorous (Healy, Enloe & DiTomaso, 2005).	H	MH
8. Stress tolerance to frost, drought, w/logg, sal. etc?	“Mature plants have been found [in Monterey, California] in very dry years” (MCA, 2006). Seed germination stimulated by fire (Healy, Enloe & DiTomaso, 2005), but no record of fire tolerance, nor tolerances to frost, salinity or waterlogging.	M	L
Reproduction			
9. Reproductive system	“Reproduce solely by seed” (Briese, 2000). No pollination information found.	M	L
10. Number of propagules produced?	Capitulum “produce up to several hundred seeds each,” (Briese, 2000), which, when multiplied by the 43 seed and flower heads pictured in Healy, Enloe & DiTomaso (2005), comes to 4 300 seeds.	H	MH
11. Propagule longevity?	“Buried seed [of <i>Onopordum</i> spp.] may persist for up to twenty years” (Healy, Enloe & DiTomaso, 2005). “Taurian thistle seeds are capable of long dormancy” (MCA, 2006).	H	MH
12. Reproductive period?	“Flowering stems develop during the second spring/summer season” (Healy, Enloe & DiTomaso, 2005) on this biennial plant (Groves, et. al, 2002), so that they produce seed for only one year.	L	MH
13. Time to reproductive maturity?	“Flowering stems develop during the second spring/summer season” (Healy, Enloe & DiTomaso, 2005), within two years of germinating.	MH	MH

Invasiveness Assessment Record

Scientific name: *Onopordum tauricum* Willd.

Common Name: Taurian thistle

QUESTION	COMMENTS	RATING	CONFIDENCE
Dispersal			
14. Number of mechanisms?	Propagules dispersed externally by animals, adapted to wind dispersal and buoyant (Cunningham et al, 2003).	MH	MH
15. How far do they disperse?	Very few to none will disperse to 1 km (via drainage creeks (MCA, 2006)), most 20-200m (via wind and animals, see Q 14).	ML	MH

References cited:

Briese, DG 2000, 'Impact of the *Onopordum capitulum* seedling *Liriodendron latifolium* on seed production by its host-plant,' *Journal of Applied Ecology*, vol. 37, pp. 238-246.

Cunningham DC, Woldendorp G, Burgess MB & Barry SC 2003, *Prioritising Sleeper Weeds for Eradication*, Department of Agriculture, Fisheries & Forestry, Canberra, Australia.

Davis, PH (ed) 1975, *Flora of Turkey*, University Press, Edinburgh.

Healy, EA, Enloe, S & JM DiTomaso 2005, *California Department of Food and Agriculture*, USA, viewed: 06/12/2005, <http://www.cdffa.ca.gov/phpps/ipc/weedinfo/onopordum.htm>.

Holst PJ & Allan CJ 1996, 'Targetted grazing of thistles using sheep and goats,' *Plant Protection Quarterly*, vol. 11(supplement 2), pp. 271-273.

Groves, RH, Moerkerk, M, Blakey, D, & Moore, PHR 2002 'Taurian thistle in Australia – a candidate for eradication?' *Thirteenth Australian Weeds Conference*, p. 287-288.

Monterey County Agriculture (MCA) 2006 *County of Monterey*, USA, viewed: 25/01/2006, www.co.monterey.ca.us/ag/nox_weeds.htm.

Tutin, TG (ed) 1980, *Flora Europaea*, University Press, Cambridge.

Revisions

Date	Revised by	Revision

Present distribution of *Onopordum tauricum* in Victoria

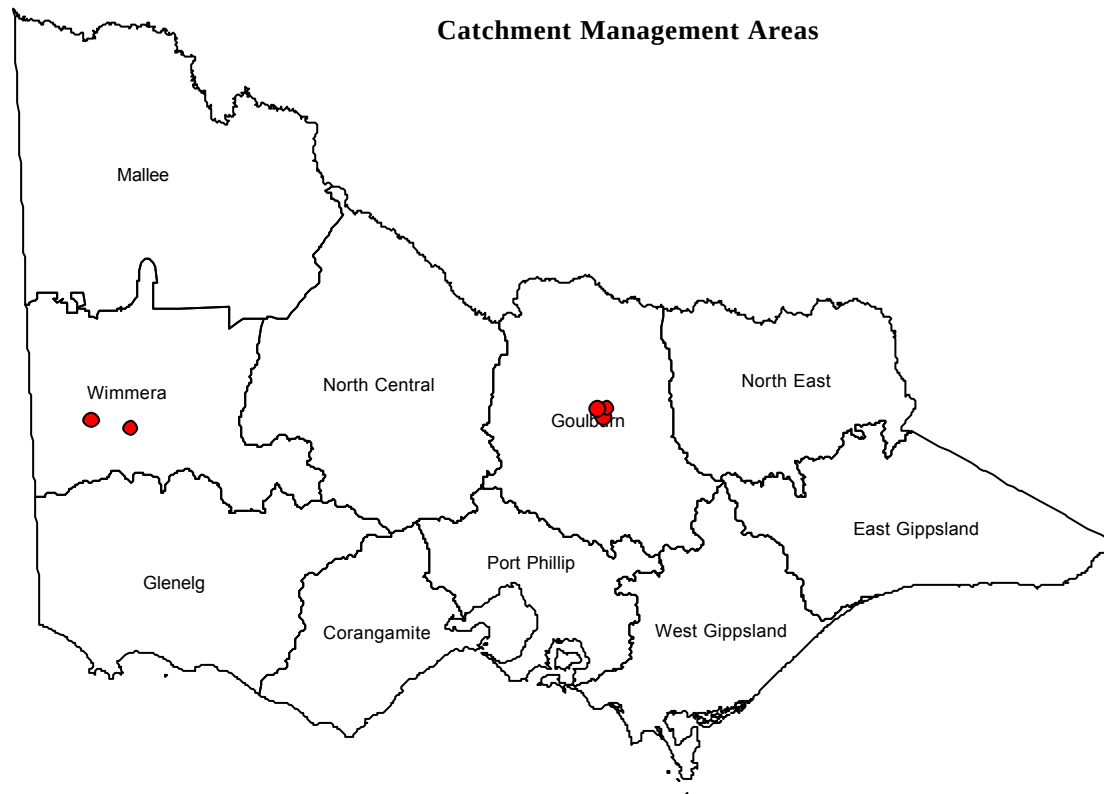
Scientific name: *Onopordum tauricum* Willd.

Common name(s): Scotch thistle, Taurian thistle

Status:

Habitat:

Native to southeastern Europe. Natural areas, disturbed sites, roadsides, fields, and especially sites with fertile soil. In California located in Modoc Plateau, northern North Coast Ranges and Sierra Nevada foothills to 1400 m (Healy *et al* 2005). In Colorado, has been found along roadsides, irrigation ditches, impacted areas along the edge of fields and waste areas. Noticed growing at elevations from 1800 – 2100 m (RBWD 2005).



Potential distribution of *Onopordum tauricum* in Victoria

Scientific name: *Onopordum tauricum* Willd.

Common name(s): Scotch thistle, Taurian thistle

Status:

Habitat:

Native to southeastern Europe. Natural areas, disturbed sites, roadsides, fields, and especially sites with fertile soil. In California located in Modoc Plateau, northern North Coast Ranges and Sierra Nevada foothills to 1400 m (Healy *et al* 2005). In Colorado, has been found along roadsides, irrigation ditches, impacted areas along the edge of fields and waste areas. Noticed growing at elevations from 1800 – 2100 m (RBWD 2005).

Potential distribution produced from CLIMATE modelling refined by applying suitable landuse and vegetation type overlays with CMA boundaries

MAP OVERLAYS USED.

Land Use:

Pasture dryland
Pasture irrigation

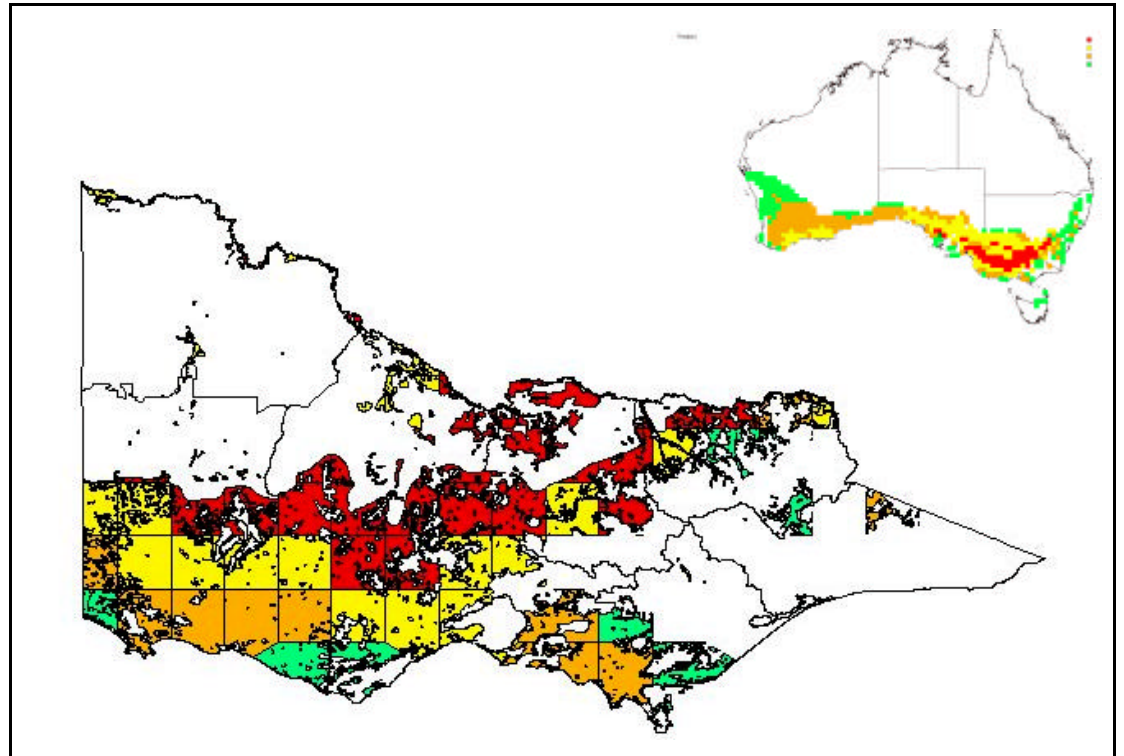
Broad vegetation types

Heathy woodland; Heath; Inland slopes woodland; grassland; Plains grassy woodland; Montane grassy woodland; Riverine grassy woodland; Rainshadow woodland

Colours indicate possibility of *Onopordum tauricum* infesting these areas.

 Red	= Very high	 Yellow	= High
 Orange	= Medium	 Green	= Likely

In the non-coloured areas the plant is unlikely to establish as the climate, soil or landuse is not presently suitable.



Impact Assessment Record

Scientific Name: *Onopordum tauricum* Willd.

Common name: taurian thistle

QUESTION	COMMENTS	RATING	CONFIDENCE
Social			
1. Restrict human access?	“Severe infestations can form tall, dense, impenetrable stands” (Healy, Enloe & DiTomaso, 2005). “Restricts access of people [to] recreation areas” (RBWD, 2005).	MH	MH
2. Reduce tourism?	“Severe infestations can form tall, dense, impenetrable stands” (Healy, Enloe & DiTomaso, 2005). “Restricts access of people [to] recreation areas” (RBWD, 2005).	MH	MH
3. Injurious to people?	Leaves and stems bear spines up to 1.5 cm long (Davis, 1975) when flowering stems develop in spring/summer of the second year of growth (Healy, Enloe & DiTomaso, 2005).	ML	MH
4. Damage to cultural sites?	Flowers purplish-pink on thorny plants up to 2 m (Tutin, 1980) in dense stands (Healy, Enloe & DiTomaso, 2005) are likely to be very obvious to the average visitor and have a moderate visual effect.	ML	H
Abiotic			
5. Impact flow?	Invades pasture, roadsides and waste places (Groves et. al, 2002), steppe, open scrub and fallow fields (Davis, 1975), drainage creeks (MCA, 2006). Terrestrial species.	L	H
6. Impact water quality?	See Q. 6. Terrestrial species.	L	H
7. Increase soil erosion?	Biennial species (Groves et al, 2002) that will die off, leaving bare patches that could be quite extensive where “dense, impenetrable stands” (Healy, Enloe & DiTomaso, 2005) have existed. The potential for large scale soil movement is moderate.	ML	MH
8. Reduce biomass?	Invades pasture, roadsides and waste places (Groves et. al, 2002), steppe, open scrub and fallow fields (Davis, 1975), drainage creeks (MCA, 2006). In this type of vegetation, the plant is likely to replace other herbaceous species.	ML	H
9. Change fire regime?	Infestations do not appear to form closed canopies (see photo CDFA, 2005), allowing indigenous vegetation to persist, although more sparsely. Post senescence “stems can persist into the next season with spiny phyllaries and receptacles attached” (Healy, Enroe & DiTomaso, 2005). In grassland and open scrub, where this plant invades (Davis, 1975) this dried vegetation adds to the fuel load, most likely causing a moderate increase in the intensity of fires.	MH	MH
Community Habitat			
10. Impact on composition (a) high value EVC	EVC=Heathy Woodland (V), CMA= Wimmera, Bioreg.=Goldfields, CLIMATE=VH. Infestations do not appear to form closed canopies (see photo CDFA, 2005), allowing indigenous vegetation to persist, although more sparsely. Sparse infestations with very little displacement of indigenous species.	L	MH
(b) medium value EVC	EVC=Sand Heathland (D), CMA= Wimmera, Bioreg.=Wimmera, CLIMATE=VH. Infestations do not appear to form closed canopies (see photo CDFA, 2005), allowing indigenous vegetation to persist, although more sparsely. Sparse infestations with very little displacement of indigenous species.	L	MH
(c) low value EVC	EVC=Heathy Woodland (LC), CMA= Wimmera, Bioreg.=Wimmera, CLIMATE=VH. Infestations do not appear to form closed canopies (see photo CDFA, 2005), allowing indigenous vegetation to persist, although more sparsely. Sparse infestations with very little displacement of indigenous species.	L	MH

Impact Assessment Record

Scientific Name: *Onopordum tauricum* Willd.

Common name: taurian thistle

QUESTION	COMMENTS	RATING	CONFIDENCE
11. Impact on structure?	Infestations do not appear to form closed canopies (see photo CDFA, 2005), allowing indigenous vegetation to persist, although more sparsely. As taurian thistle “seedlings do not compete well with established perennial grasses” (Healy, Enroe & DiTomaso, 2005), this plant is unlikely to have a major effect on intact ecosystems. In grassland and open scrub, where this plant invades (Davis, 1975) and strongly competes with native plants for resources (Healy, Enroe & DiTomaso, 2005), it is likely to have a <u>minor impact on the forb and herb layers, but not the shrub layer (20-60% of the floral strata).</u>	ML	MH
12. Effect on threatened flora?	No information found.	MH	L
Fauna			
13. Effect on threatened fauna?	No information found.	MH	L
14. Effect on non-threatened fauna?	Strongly competes with native plants for resources (Healy, Enroe & DiTomaso, 2005) and “restricts access of...large mammals to foraging and watering” (RBWD, 2005). This plant will reduce the amount of native vegetation growing and also its availability as a food source to native animals. Infestations may reduce the number of animals in a local area.	MH	MH
15. Benefits fauna?	Unlikely as a food source (see Q. 14), but a possible shelter to desirable species of small mammals	MH	MH
16. Injurious to fauna?	Leaves and stems bear spines up to 1.5 cm long (Davis, 1975) when flowering stems develop in spring/summer of the second year of growth (Healy, Enloe & DiTomaso, 2005).	MH	MH
Pest Animal			
17. Food source to pests?	Goats eat the seed heads of the related <i>O. illyricum</i> so it is likely that taurian thistle would also be a food source to these pests (Holst & Allan, 1996).	ML	H
18. Provides harbor?	As this plant and “restricts access of...large mammals” (RBWD, 2005) it is likely to provide harbour to small pest species, such as rats.	ML	M
Agriculture			
19. Impact yield?	“Serious pasture weeds in southern Australia” (Briese et al, 1995). Reduces productivity (Healy, Enroe & DiTomaso, 2005). “Severe infestations can form tall, dense, impenetrable stands” (Healy, Enloe & DiTomaso, 2005) that “Restricts access of...large mammals to foraging and watering” (RBWD, 2005). May have a major impact on the carrying capacity of infested land by more than 5%. Reducing stock levels and allowing perennial grasses to establish is likely to drastically reduce the establishment of weed seedlings (Healy, Enloe & DiTomaso, 2005), allowing grazing to continue	MH	MH

Impact Assessment Record

Scientific Name: *Onopordum tauricum* Willd.

Common name: taurian thistle

QUESTION	COMMENTS	RATING	CONFIDENCE
20. Impact quality?	Similar <i>Onopordum</i> spp. (<i>O. acanthium</i> & <i>O. illyricum</i>) contribute to vegetable faults in wool (Parsons & Cuthbertson, 1992). Taurian thistle has very similar flower/seed heads (Healy, Enloe & DiTomaso, 2005) that would also be likely to reduce the quality of wool, which might be rejected for sale.	H	MH
21. Affect land value?	The ability to reduce infestations of this weed with good cultural methods (Healy, Enloe & DiTomaso, 2005) means that this weed should not significantly affect land value.	L	MH
22. Change land use?	In order to reduce the density of infestations, cultural methods may need to change, with temporary removal of stock from infested areas while perennial pasture re-establishes methods (Healy, Enloe & DiTomaso, 2005).	ML	MH
23. Increase harvest costs?	Harvest costs should not be increased, as control in pasture is via good cultural methods (Healy, Enloe & DiTomaso, 2005).	L	MH
24. Disease host/vector?	No record of this plant as a disease host/vector in Healy, Enloe & DiTomaso (2005).	L	MH

References cited:

- Briese DT, Sheppard AW & Reifenberg JM 1995, Open-field host-specificity testing for potential biological control agents of *Onopordum* thistles,' *Biological Control*, Vol. 5, p. 158-166.
- Davis, PH (ed) 1975, *Flora of Turkey*, University Press, Edinburgh.
- Groves, RH, Moerkerk, M, Blakey, D, & Moore, PHR 2002 'Taurian thistle in Australia – a candidate for eradication?' *Thirteenth Australian Weeds Conference*, p. 287-288.
- Healy, EA, Enloe, S & JMDiTomaso 2005, *California Department of Food and Agriculture*, USA, viewed: 06/12/2005, <http://www.cdfa.ca.gov/phpps/ipc/weedinfo/onopordum.htm>
- Holst PJ & Allan CJ 1996, 'Targetted grazing of thistles using sheep and goats,' *Plant Protection Quarterly*, vol. 11(supplement 2), pp. 271-273.
- Monterey County Agriculture (MCA) 2006 *County of Monterey*, USA, viewed: 25/01/2006, www.co.monterey.ca.us/ag/nox_weeds.htm
- Parsons WT & Cuthbertson EG 1992, *Noxious Weeds of Australia*, Inkata Press, Melbourne and Sydney.
- Rio Blanco Weed Department (RBWD) 2005, *Rio Blanco County Government*, USA, viewed: 26/01/2006, www.co.rio-blanco.co.us/weedcontrol.
- Tutin, TG (ed) 1980, *Flora Europaea*, University Press, Cambridge.

Revisions

Date Revised by Revision

Invasiveness Assessment Record

Scientific name: *Opuntia aurantiaca* Lindl.

Common Name: tiger pear

QUESTION	COMMENTS	RATING	CONFIDENCE
Establishment			
1. Germination requirements?	“Capable of rooting to form new plants, if it comes into contact with the soil (Zimmerman, 1978). “When joints are broken off they readily take root in most parts of the State during the greater part of the year” (Maiden, 1911). Opportunistically takes root.	H	H
2. Establishment requirements?	“This species is often difficult to see in long grass” (Auld & Medd, 1992), suggesting that it can grow under moderate cover.	MH	MH
3. How much disturbance is required?	Whilst this plant commonly invades highly disturbed areas, such as sparse drought-adapted plant communities (Zimmerman, 1978), riverbanks (Moran & Annecke, 1979), pasture land (Hosking & Deighton, 1981) and “areas from which erect prickly pear had been cleared by cactoblastis,” (Parsons & Cuthbertson, 1992); it is also noted as an invader of dense valley bushveld (Zimmerman, 1978) and lowland grassland & grassy woodland, (Carr et al, 1992), relatively intact ecosystems.	MH	MH
Growth/Competitive			
4. Life form?	“Low-growing, many-jointed...cactus” (Moran & Zimmerman, 1991) with underground tubers (Moran & Annecke, 1979) that need to be grubbed out to control the plant (Parsons & Cuthbertson, 1992).	ML	H
5. Allelopathic properties?	None described in an extensive literature on this plant (eg. Moran & Annecke, 1979; Hosking & Deighton, 1981; Maiden, 1911; Parsons & Cuthbertson, 1992).	L	H
6. Tolerates herb pressure?	“ <i>Opuntia</i> species are not usually grazed by stock because the stout spines and bristles damage their tongues and lips, but, in times of drought, plants are eaten” (Parsons & Cuthbertson, 1992). Subject to several insect and pathogenic controls, some of which control the weed in “hot, dry conditions” and others that “usually fail to kill all joints [stems]” (Hosking, McFadyen & Murray, 1988). In South Africa “dense populations of the weed are presently confined to riverine bush and to higher rainfall regions where cochineal insects are relatively ineffective, as is the case in Australia” (Moran & Zimmerman, 1991).	ML	H
7. Normal growth rate?	“Was originally dwarfed by the masses of...common pear and...spiny pest pear...larger cactii” (Hosking & Deighton, 1979), however Tanner (2004a) claims that tiger pear “shoots can grow as long as 10cm in a couple of weeks,” which will exceed most other ground flora.	MH	MH
8. Stress tolerance to frost, drought, w/logg, sal. etc?	“All <i>Opuntia</i> species are drought-resistant” (Parsons & Cuthbertson, 1992). “Remarkable drought resistance” (Zimmerman, 1978). “Because of their high moisture content, plants are not easily burnt” (Parsons & Cuthbertson, 1992) so that in South Africa, “plants were collected, piled on firewood and later burned” (Moran & Annecke, 1979). Fire alone has not been suggested as a control method in comprehensive analyses of this pest (Hosking & Deighton, 1979; Parsons & Cuthbertson, 1992 or Zimmerman, 1978). This suggests that <i>O. aurantiaca</i> has some fire tolerance. This is also supported by Tanner (2004a)- “Tiger pear can be destroyed by fire. Tops of plants are easily killed, butts require extra heat.” “Common along watercourses in north-eastern New South Wales and south-eastern Queensland,” (Hosking, McFadyen & Murray, 1988); “subhumid to semi-arid areas of warm-temperate and subtropical regions” (Parsons & Cuthbertson, 1992). This suggests that tiger pear is unlikely to tolerate frosts. Distribution in Australia is limited to areas far from the coast (see distribution map in Hosking & Deighton, 1981), suggesting that tiger pear may have low salt tolerance also.	ML	H

Invasiveness Assessment Record

Scientific name: *Opuntia aurantiaca* Lindl.

Common Name: tiger pear

QUESTION	COMMENTS	RATING	CONFIDENCE
	As a cactus, this plant is unlikely to tolerate waterlogging. This plant displays some tolerance to two stressors but is likely to be susceptible to at least two.		
Reproduction			
9. Reproductive system	“The seeds of <i>O. aurantiaca</i> are not viable” (Hosking, McFadyn & Murray, 1988). Fruits are “filled with minute infertile seeds” (Zimmerman, 1978). “Tiger pear grows from segments and not from seed” (Hosking & Deighton, 1981).	MH	H
10. Number of propagules produced?	“The seeds of <i>O. aurantiaca</i> are not viable” (Hosking, McFadyn & Murray, 1988). Fruits are “filled with minute infertile seeds” (Zimmerman, 1978).	L	H
11. Propagule longevity?	“A detached segment has been known to survive indoors for 3 years” (Parsons & Cuthbertson, 1992). Viable seeds not produced (see Q. 9).	L	H
12. Reproductive period?	Plants are very long-lived (Parsons & Cuthbertson, 1992).	H	MH
13. Time to reproductive maturity?	Never reaches reproductive maturity as it does not produce viable seed (see Q.9).	L	H
Dispersal			
14. Number of mechanisms?	“Small segments...attach to wool and hides of animals and to footwear and tyres of passing vehicles” (Parsons & Cuthbertson, 1992). “Another-and probably major-means of spread is by floodwaters” (Hosking & Deighton, 1981).	MH	MH
15. How far do they disperse?	“Widely dispersed as a result of adhering to stock, wild animals...Leaf-pads are also transported by run-off water” (Zimmerman, 1978). It is very likely that transporting stock and floodwaters have transported this plant many kilometers in the past (see Hosking & Deighton, 1981) and will continue to do so.	H	H

References cited:

- Auld, BA & Medd, RW 1992, *Weeds. An illustrated botanical guide to the weeds of Australia*, Inkata Press, Melbourne.
- Auld, BA, Hosking, J & McFadyn, RE 1982/83, ‘Analysis of the spread of tiger pear and parthenium weed in Australia,’ *Australian Weeds*, Vol. 2(2), p. 56-60.
- Carr, GW, Yugovic, JV & Robinson, KE 1992, *Environmental Weed Invasions in Victoria*, Department of Conservation and Environment, Melbourne.
- Hosking, JR & Deighton, PJ 1979, ‘The distribution and control of *Opuntia aurantiaca* in New South Wales,’ *Proceedings 7th Asian-Pacific Weed Science Society Conference*.
- Hosking, JR & Deighton, PJ 1981, ‘tiger pear is a continuing problem,’ *Agricultural Gazette of N.S.W.*, vol. 92(3), pp. 43-45.
- Hosking, JR, McFadyn, RE & Murray, ND 1988, ‘Distribution and biological control of cactus species in eastern Australia,’ *Plant Protection Quarterly*, Vol. 3(3), p. 115-123.
- Maiden, JH 1911, ‘The Prickly Pears of Interest to Australians,’ *Agricultural Gazette of N.S.W.*, Vol. 22, pp. 321-328.
- Moran, VC & Annecke, DP 1979, ‘Critical reviews of biological pest control in South Africa. 3. The jointed cactus, *Opuntia aurantiaca* Lindley,’ *Journal entomological Society of South Africa*, vol. 42(2), pp. 299-329.
- Moran, VC & Zimmerman, HG 1991, ‘Biological control of jointed cactus, *Opuntia aurantiaca* (Cactaceae), in South Africa,’ *Agriculture, Ecosystems and Environment*, Vol 37, p. 5-27.
- Parsons, WT & Cuthbertson, EG 1992, *Noxious Weeds of Australia*, Inkata Press, Melbourne and Sydney.

Invasiveness Assessment Record

Scientific name: *Opuntia aurantiaca* Lindl.

Common Name: tiger pear

Tanner, LR 2004a, North West Weeds, Gwydir Shire Council, Bingara (north west NSW), viewed: 13/01/2006, http://www.northwestweeds.nsw.gov.au/tiger_pear.htm.

Tanner, LR 2004b, North West Weeds, Gwydir Shire Council, Bingara (north west NSW), viewed: 13/01/2006, http://www.northwestweeds.nsw.gov.au/prickly_pear_history.htm.

Zimmerman, HG 1978 'Jointed cactus,' in *Plant **Invaders**: a guide to the identification and control of twenty-six plant invaders of the Province of the Cape of Good Hope*, Editor CH Stirton, pp. 101-108, Department of Nature and Environmental Conservation, Cape Town.

Revisions

Date	Revised by	Revision

Present distribution of *Opuntia aurantiaca* in Victoria

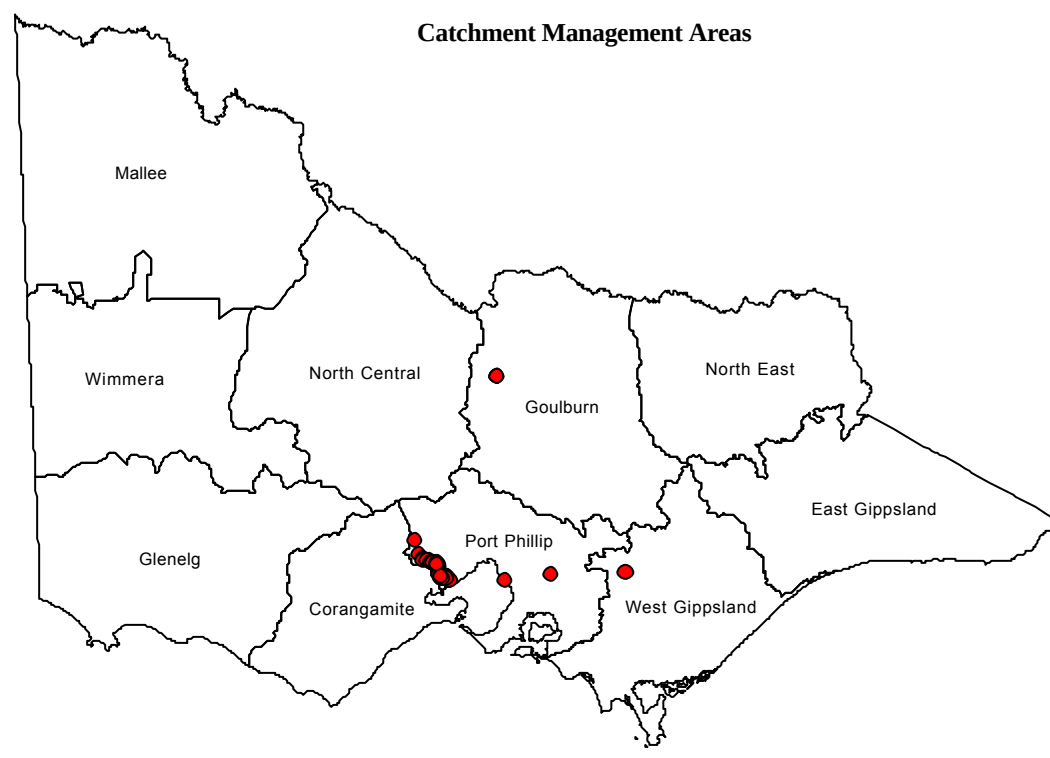
Scientific name: *Opuntia aurantiaca* Lindl.

Common name(s): Tiger-pear, jointed prickly-pear

Status:

Habitat:

Subhumid to semi-arid areas of warm-temperate and subtropical regions. Occurs in many parts of New South Wales and Queensland, especially along streams where it encroaches onto adjoining land (Parsons & Cuthbertson 2001). Native of Uruguay and the Entre Rios region of Argentina (Hosking *et al* 1988).



Potential distribution of *Opuntia aurantiaca* in Victoria

Scientific name: *Opuntia aurantiaca* Lindl.

Common name(s): Tiger-pear, jointed prickly-pear

Status:

Habitat:

Subhumid to semi-arid areas of warm-temperate and subtropical regions. Occurs in many parts of New South Wales and Queensland, especially along streams where it encroaches onto adjoining land (Parsons & Cuthbertson 2001). Native of Uruguay and the Entre Rios region of Argentina (Hosking *et al* 1988).

Potential distribution produced from CLIMATE modelling refined by applying suitable landuse and vegetation type overlays with CMA boundaries

MAP OVERLAYS USED.

Land Use:

Pasture dryland

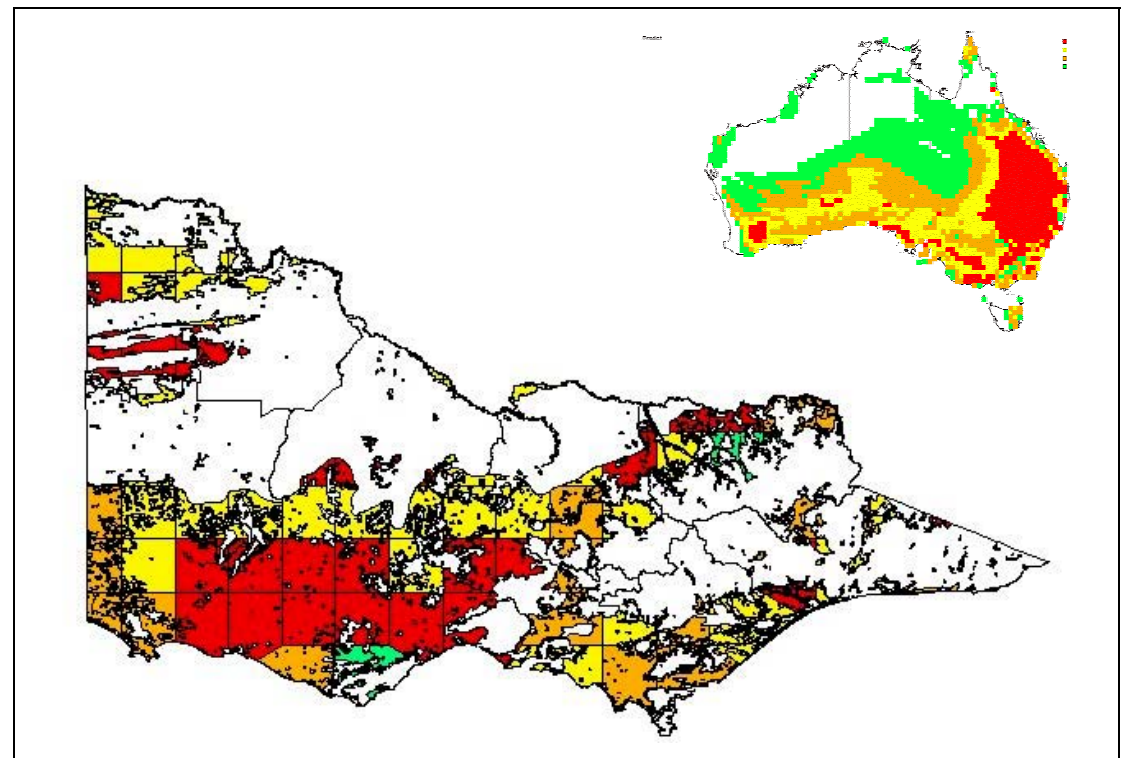
Broad vegetation types

Coastal grassy woodland; heathy woodland; inland slopes woodland; sedge-rich woodland; grassland; plains grassy woodland; herb-rich woodland; riverine grassy woodland; riparian forest; rainshadow woodland; mallee; mallee woodland; Wimmera/mallee woodland

Colours indicate possibility of *Opuntia aurantiaca* infesting these areas.

Red	= Very high	Yellow	= High
Orange	= Medium	Green	= Likely

In the non-coloured areas the plant is unlikely to establish as the climate, soil or landuse is not presently suitable.



Impact Assessment Record

Scientific Name: *Opuntia aurantiaca* (Lindl.)

Common name: tiger pear

QUESTION	COMMENTS	RATING	CONFIDENCE
Social			
1. Restrict human access?	"Dense tiger pear forms an impenetrable spiny ground-cover" (NRM, 2005) "often difficult to see in long grass" (Auld & Medd, 1992) and up to 1.5m high (Henderson, 2001), with spines up to 4cm long (Hosking, McFadyen & Murray, 1988) which, on a shrub this size, would prohibit access by humans.	H	MH
2. Reduce tourism?	Large infestations of this weed, "common along watercourses" (Hosking, McFadyen & Murray, 1988) would prevent access (see Q. 1) and recreational uses of rivers.	H	H
3. Injurious to people?	"Armed with needle-sharp, barbed spines, about 1-3cm long" (Zimmerman, 1978). "In addition to the obvious objectionable nature of the large sharp spines...barbed bristles...readily penetrate human skin causing severe irritation and are difficult to remove" (Parsons & Cuthbertson, 2001). "I trod on a piece with my boot, and the spines readily entered the hard sole leather" (Farlow pers. comm. in Maiden, 1911).	H	H
4. Damage to cultural sites?	Thickets would have a negative visual impact on cultural sites. See picture in Parsons & Cuthbertson, 2001.	ML	MH
Abiotic			
5. Impact flow?	"Common along watercourses" (Hosking, McFadyen & Murray, 1988) but grows along riverbanks (Moran & Annecke, 1979). Terrestrial species.	L	H
6. Impact water quality?	Terrestrial species (see Q. 6).	L	H
7. Increase soil erosion?	Prickly pear in general was listed as "preventer of land erosion, and as a soil arrester on barren spots" in Maiden (1911). It is a very long-lived plant (Parsons & Cuthbertson, 1992) that could bind soil with its roots and reduce the impact of rain with its foliage.	L	H
8. Reduce biomass?	"Patches...grow densely" (Parsons & Cuthbertson, 2001) and, being a fleshy succulent, would tend to increase or maintain biomass in pasture and grassland (where it is noted to invade in Carr et al, 1992 and Hosking & Deighton, 1981).	L	MH
9. Change fire regime?	"Because of their high moisture content, plants are not easily burnt" (Parsons & Cuthbertson, 1992) so that in South Africa, "plants were collected, piled on firewood and later burned" (Moran & Annecke, 1979), supporting that notion that tiger pear do not burn without an associated fuel load. Likely to greatly decrease fire frequency in thick infestations and intensity in more sparse infestations.	H	MH
Community Habitat			
10. Impact on composition (a) high value EVC	EVC=Damp Sands Herb Rich Woodland (V), CMA=Glenelg-Hopkins, Bioreg.=Victorian Volcanic Plain, CLIMATE=VH. Photographs in Tanner (2004a & 2004b) show dense infestations that have had a major impact on the ground layer flora. Major displacement of ground layer flora.	MH	MH
(b) medium value EVC	EVC=Woorinen Sands Mallee (D), CMA=Mallee, Bioreg.=Murray Mallee, CLIMATE=VH. Photographs in Tanner (2004a & 2004b) show dense infestations that have had a major impact on the ground layer flora. Major displacement of ground layer flora.	MH	MH
(c) low value EVC	EVC=Heathy Woodland (LC), CMA=Glenelg-Hopkins, Bioreg.=Dundas Tablelands, CLIMATE=VH. Photographs in Tanner (2004a & 2004b) show dense infestations that have had a major impact on the	MH	MH

Impact Assessment Record

Scientific Name: *Opuntia aurantiaca* (Lindl.)

Common name: tiger pear

QUESTION	COMMENTS	RATING	CONFIDENCE
	ground layer flora. Major displacement of ground layer flora.		
11. Impact on structure?	“Plants growing in high rainfall bushveld areas, where there are other plants to lean on, reach a height of 2m” (Zimmerman, 1978). “This species is often difficult to see in long grass” (Auld & Medd, 1992). It’s potential height suggests that tiger cactus could impact on the ground layer and the shrub layer of vegetation communities. Photographs in Tanner (2004a & 2004b) show dense infestations that have had a major impact on the ground layer flora. As they climb into higher vegetation, tiger pear is likely to be less dense and thus have a more minor effect.	MH	MH
12. Effect on threatened flora?	No information available	MH	L
Fauna			
13. Effect on threatened fauna?	No information available	MH	L
14. Effect on non-threatened fauna?	“Heavy infestations limit the grazing potential of [land]” as prickly pear is “armed with needle-sharp, barbed spines, about 1-3cm long” (Zimmerman, 1978). This would prohibit access to food sources and probably to shelter also for native fauna.	H	H
15. Benefits fauna?	“A native insect has been recorded feeding on flowers and young joints” (Hosking, McFadyyn & Murray, 1988), however because of its ability to form spiny impenetrable infestations (see Q. 14), this plant would not normally benefit fauna as a food source. As it can harbour rabbits (Parsons & Cuthbertson, 2001) it may be able to provide shelter to small native mammals too.	MH	MH
16. Injurious to fauna?	“ <i>Opuntia</i> species are not usually grazed by stock because the stout spines and bristles damage their tongues and lips, but, in times of drought, plants are eaten” (Parsons & Cuthbertson, 2001). “Animals...may become lame as well as full of sores and abscesses as a result of the adherence of barbed spines to different parts of their bodies” (Zimmerman, 1978). Large spines have proven dangerous to fauna.	H	H
Pest Animal			
17. Food source to pests?	“ <i>O. stricta</i> seed...is spread in the droppings of birds, foxes and other animals” (Parsons & Cuthbertson, 2001) and whilst <i>O. aurantiaca</i> lacks viable seed, it does produce fruit (Zimmerman, 1978) that are edible (so presumably attractive to other animals) and also hosts to fruit fly (Parsons & Cuthbertson, 2001). Food source to at least one serious pest animal at a crucial time of year.	H	MH
18. Provides harbor?	“Effective harbour for pest animals such as rabbits” (Parsons & Cuthbertson, 2001).	H	MH
Agriculture			
19. Impact yield?	“High densities of the weed reduce the productivity of pastoral land” (Moran & Zimmerman, 1991). “Heavy infestations limit the grazing potential of veld...in the supply of nutritive plants” (Zimmerman, 1978). In South Africa, “grazing by livestock on many properties was severely inhibited” (Moran & Zimmerman, 1991). In USA, prickly pear in general has been estimated to have “decreased the carrying	H	H

Impact Assessment Record

Scientific Name: *Opuntia aurantiaca* (Lindl.)

Common name: tiger pear

QUESTION	COMMENTS	RATING	CONFIDENCE
	capacity of [land] one-fourth to one-third" (Maiden, 1911).		
20. Impact quality?	"Small segments...attach to wool and hides of animals" (Parsons & Cuthbertson, 2001). "The numerous long barbed spines...are injurious to livestock" (Moran & Zimmerman, 1991). "Grazing animals, especially lambs, may become lame as well as full of sores as and abscesses as a result of the adherence of barbed spines to different parts of their bodies...wool is down-graded if it is tangled with spiny leaf-pads" (Zimmerman, 1978). Meat may be downgraded if spines penetrate the muscle.	MH	H
21. Affect land value?	"Infestations...seriously inhibit pastoral activities and result in a marked devaluation in the price of infested land" (Zimmerman, 1978). In USA, depreciation due to general prickly pear infestations have been estimated at 50% (Maiden, 1911). "Tiger pear is only a problem of grazing land, as it is easily destroyed by ploughing...Unfortunately, most infested grazing land is unsuitable for cultivation" (Hosking & Deighton, 1981).	H	H
22. Change land use?	"The effectiveness of all control measures...is limited because of the difficulty of treating lose leaf-pads and small plants...Dense infestations of jointed cactus have the potential of making farming uneconomic or even impossible" (Zimmerman, 1978). "Can cover pasture land rendering it useless for grazing" (Hosking & Deighton, 1979). Tiger pear "is easily destroyed by ploughing [but] unfortunately, much infeted grazing land is unsuitable for cultivation" (Hosking & Deighton, 1981). Difficulty and thus expense of control, combined with yeild and quality impacts may cause farmland to be abandoned.	H	H
23. Increase harvest costs?	"Costly chemical control programme (Moran & Zimmerman, 1991). "[Chemical] control is made more difficult on the steep terrain where it is frequently necessary" (Auld et al, 1982/83). "South Africa's most expensive weed" (Zimmerman, 1978).	H	H
24. Disease host/vector?	"Hosts of fruit fly" (Parsons & Cuthbertson, 2001).	H	MH

References cited:

- Auld, BA & Medd, RW 1992, *Weeds. An illustrated botanical guide to the weeds of Australia*, Inkata Press, Melbourne.
- Henderson, L 2001, *Alien Weeds and Invasive Plants*, Agricultural Research Council, South Africa.
- Hosking, JR & Deighton, PJ 1979, 'The distribution and control of *Opuntia aurantiaca* in New South Wales,' *Proceedings 7th Asian-Pacific Weed Science Society Conference*.
- Hosking, JR & Deighton, PJ 1981, 'tiger pear is a continuing problem,' *Agricultural Gazette of N.S.W.*, vol. 92(3), pp. 43-45.
- Hosking JR, McFadyn, RE & Murray, ND 1988, 'Distribution and biological control of cactus species in eastern Australia,' *Plant Protection Quarterly*, Vol. 3(3), p. 115-123.
- Maiden, JH 1911, 'The Prickly Pears of Interest to Australians,' *Agricultural Gazette of N.S.W*, Vol. 22 pp. 321-328.
- Natural Resources and Mines (NRM) 2005, *Prickly pear identification and their control*, Queensland government.
- Parsons, WT & Cuthbertson, EG 2001, *Noxious Weeds of Australia*, Inkata Press, Melbourne and Sydney.

Impact Assessment Record

Scientific Name: *Opuntia aurantiaca* (Lindl.)

Common name: tiger pear

Zimmerman, HG 1978 'Jointed cactus,' in *Plant **Invaders**: a guide to the identification and control of twenty-six plant invaders of the Province of the Cape of Good Hope*, Editor CH Stirton, pp. 101-108, Department of Nature and Environmental Conservation, Cape Town.

Revisions

Date	Revised by	Revision

Invasiveness Assessment Record

Scientific name: *Parkinsonia aculeata* L.

Common Name: Jerusalem-thorn

QUESTION	COMMENTS	RATING	CONFIDENCE
Establishment			
Germination requirements?	Germinate any time of year if moisture is available and can germinate over a wide temperature range. Requires wet soil conditions for several days to stimulate germination (Parsons & Cuthbertson, 1992).	H	MH
Establishment requirements?	Found in moist areas receiving run-off. Growth is impeded in shaded areas (Parsons & Cuthbertson, 1992). "It requires full or nearly full sunlight to survive and reproduce" (Francis, 2003).	ML	MH
How much disturbance is required?	Found especially near creeks, rivers, bores or dams. Needs some kind of disturbance to become established. Will establish in areas of only minor disturbance " (Francis, 2003).	MH	MH
Growth/Competitive			
Life form?	Leguminous shrub (Parsons & Cuthbertson, 1992).	MH	MH
Allelopathic properties?	None described (Parsons & Cuthbertson, 1992).	L	MH
Tolerates herb pressure?	Livestock, especially sheep, browses foliage and pods. Under a biocontrol program with several insects showing potential as control agents (Parsons & Cuthbertson, 1992). Can be attacked by snow scale and termites (World Agroforestry Centre, n.d.). Research has shown up to 95% of seed banks can be destroyed by two Parkinsonia seed beetles. <i>Rhinacloa callicrates</i> is a leaf bug having no significant impact in Queensland to date. Weeds still persist (van Rangelrooy & Flanagan, 1999).	ML	MH
Normal growth rate?	Forms dense thickets and shades out pasture species (Parsons & Cuthbertson, 1992). Noted for its rapid growth (minimum estimate for a fast growing woody shrub) (World Agroforestry Centre, n.d.). Will exceed most other species of same life form.	H	MH
Stress tolerance to frost, drought, w/logg, sal. etc?	Extremely drought resistant. Can survive in saline soils. Frost tolerant up to -5°C (World Agroforestry Centre, n.d.). Sensitive to waterlogging. Seedlings will not withstand fire but mature plants have high survival rate (DNRE, 2001).	MH	MH
Reproduction			
Reproductive system	Grows from seed, root or shoot cuttings although vegetative reproduction is not part of the plants natural cycle. Pollinated by bees but unknown if self-pollinator (World Agroforestry Centre, n.d.).	L	MH
Number of propagules produced?	One pod usually contains between 2 to 6 seeds but can contain up to 9. Produces "large numbers of seeds and pods" (DNRE, 2004). "Profusely produces seeds" (World Agroforestry Centre, n.d.). Assume that produces greater than 2000 seeds per flowering event.	H	MH
Propagule longevity?	Two types of seeds and about 25% of the light brown seeds germinate readily. The rest of the light brown seeds and all of the dark brown seeds have hard seed coats that must be scarified before they will germinate (Francis, 2003). Viable for up to three years (World Agroforestry Centre, n.d.).	L	MH

Invasiveness Assessment Record

Scientific name: *Parkinsonia aculeata* L.

Common Name: Jerusalem-thorn

QUESTION	COMMENTS	RATING	CONFIDENCE
Reproductive period?	The plants can live up to 30 years. Species is capable of forming dense monocultures (Francis, 2003).	H	MH
Time to reproductive maturity?	Flower in the second or third growth season (Parsons & Cuthbertson, 1992).	ML	MH
Dispersal			
Number of mechanisms?	Moved by floodwaters and streams. Birds eat seeds. Movement through mud, humans and machinery (Parsons & Cuthbertson, 1992).	H	MH
How far do they disperse?	Due to the dispersal mechanisms (see above), it is very likely that some of the propagules will be dispersed greater than 1 km.	H	MH

References cited:

Department of Natural Resources, Mines and Energy, 2004, *Parkinsonia: approaches to the management of Parkinsonia (Parkinsonia aculeata) in Australia*, Department of Natural Resources, Mines and Energy, Townsville, viewed: 31 October 2005, http://www.weeds.org.au/docs/Parkinsonia_Mgmt-1.pdf

Department of Natural Resources, Mines and Energy, 2001, *Parkinsonia: Jerusalem thorn or jelly bean tree Parkinsonia aculeata*, Factsheet, PP36, Department of Natural Resources, Mines and Energy, Queensland, viewed: 31 October 2005, <http://www.nrm.qld.gov.au/factsheets/pdf/pest/pp36.pdf>

Francis, J K 2003, *Parkinsonia aculeata* L., United States Department of Agriculture Forest service, Washington, viewed: 31 October 2005, <http://www.fs.fed.us/global/iitf/pdf/shrubs/Parkinsonia%20aculeate.pdf>

Parsons, W T & Cuthbertson, E G 1992, *Noxious weeds of Australia*, 2nd ed., CSIRO Publishing, Collingwood.

van Rangelrooy, D.S., Flanagan, G.J. (1999). *Parkinsonia* (*Parkinsonia aculeata*). Agnote 569. Department of Business, Industry and Resource Development, Northern Territory. Available: <http://www.nt.gov.au/dbird/dpif/pubcat/agnotes/weeds/569.pdf> Accessed: 14/07/03.

World Agroforestry Centre n.d., *Agroforestry database: Parkinsonia aculeata*, World Agroforestry Centre, Nairobi, viewed: 31 October 2005, <http://www.worldagroforestry.org/Sites/TreeDBS/aft.asp>

Revisions

Date Revised by Revision

Present distribution of *Parkinsonia aculeata* in Victoria

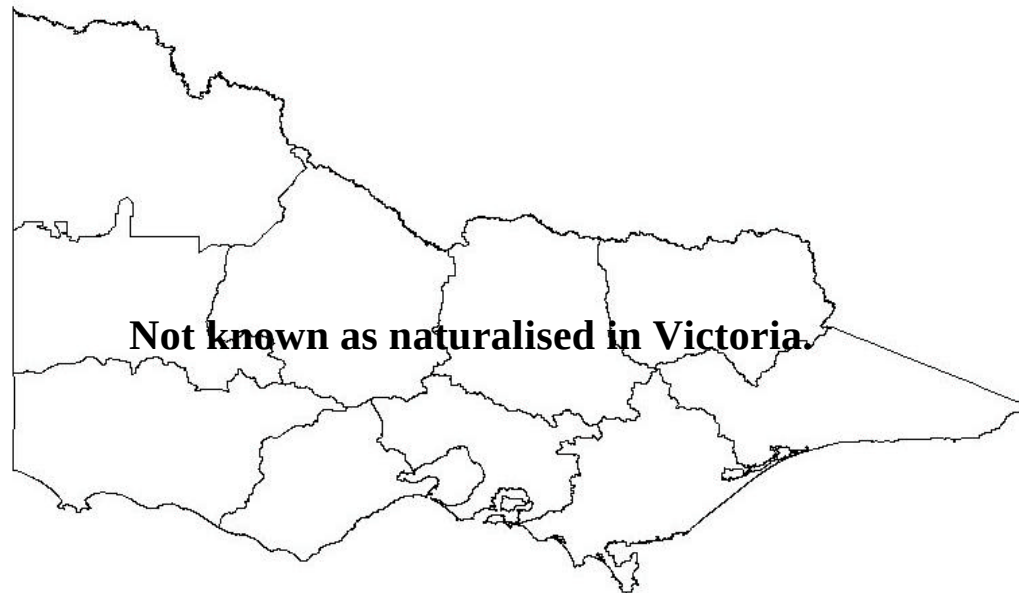
Scientific name: *Parkinsonia aculeata* L.

Common name(s): parkinsonia, Jerusalem-thorn

Status:

Habitat:

Semi-arid to subhumid tropics and subtropics. Thrives on a wide range of soil types, varying from sands to self-mulching clays. Mostly found in better watered areas receiving run-off and near creeks, rivers, bores or dams. (Parsons & Cuthbertson 2001). Great temperature range from very hot to several degrees below freezing with frosts. Native to semi-desert vegetation, especially desert valleys and desert grassland zones (World Agroforestry Centre n.d.)



Potential distribution of *Parkinsonia aculeata* in Victoria

Scientific name: *Parkinsonia aculeata* L.
Common name(s): parkinsonia, Jerusalem-thorn
Status:

Habitat:

Semi-arid to subhumid tropics and subtropics. Thrives on a wide range of soil types, varying from sands to self-mulching clays. Mostly found in better watered areas receiving run-off and near creeks, rivers, bores or dams. (Parsons & Cuthbertson 2001). Great temperature range from very hot to several degrees below freezing with frosts. Native to semi-desert vegetation, especially desert valleys and desert grassland zones (World Agroforestry Centre n.d.)
Potential distribution produced from CLIMATE modelling refined by applying suitable landuse and vegetation type overlays with CMA boundaries

MAP OVERLAYS USED.

Land Use:

Pasture dryland

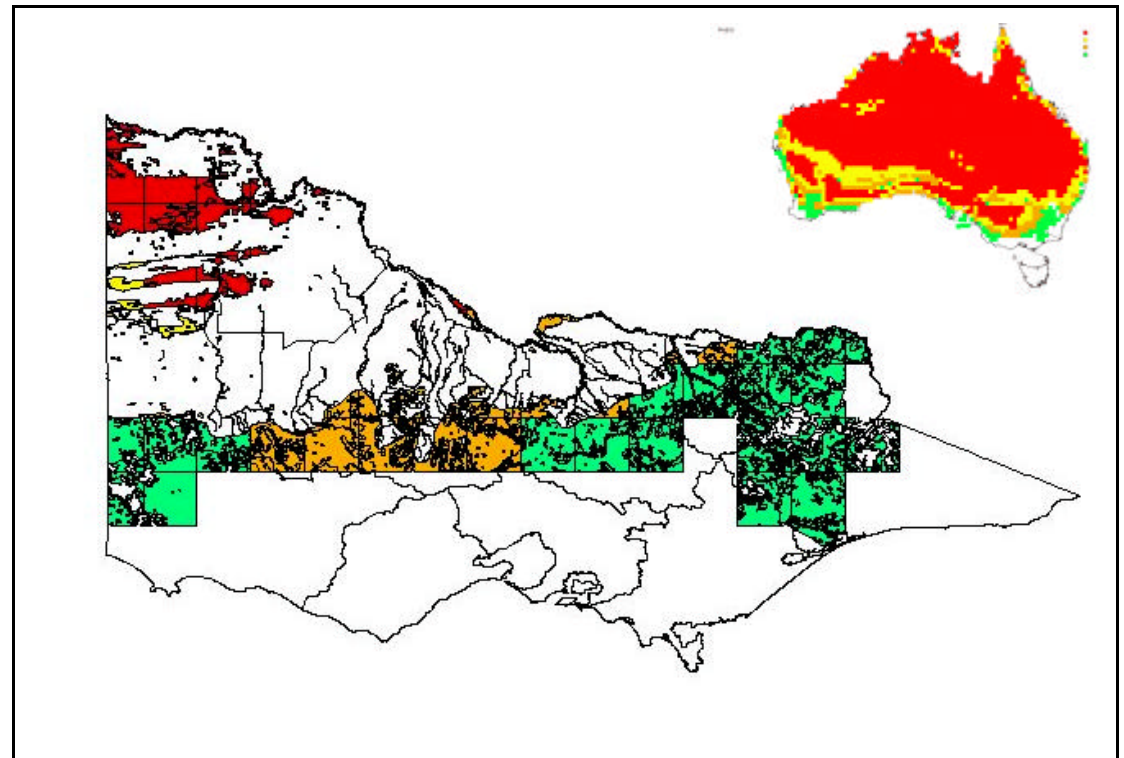
Broad vegetation types

Coastal scrubs and grassland; coastal grassy woodland; swamp scrub; box ironbark forest; inland slopes woodland; dry foothill forest; moist foothill forest; grassland; plains grassy woodland; valley grassy forest; herb-rich woodland; riverine grassy woodland; riparian forest; rainshadow woodland; mallee; boinka-raak; mallee woodland; Wimmera/mallee woodland

Colours indicate possibility of *Parkinsonia aculeata* infesting these areas.

Red	= Very high	Yellow	= High
Orange	= Medium	Green	= Likely

In the non-coloured areas the plant is unlikely to establish as the climate, soil or landuse is not presently suitable.



Impact Assessment Record

Scientific Name: *Parkinsonia aculeata* L.

Common name: Jerusalem thorn

QUESTION	COMMENTS	RANKING	CONFIDENCE
Social			
1. Restrict human access?	A branching spiny shrub or small tree of irregular habit, from 2 to 8 m high. "It may form dense thickets especially along creeks and rivers...limiting access to watering points" (Parsons & Cuthbertson, 1992). "Parkinsonia can form dense impenetrable thickets making areas of land inaccessible for people" (van Rangelrooy & Flanagan, 1999).	MH	MH
2. Reduce tourism?	"The value of the outback tourism industry is increasing and Parkinsonia infestations reduce this natural attraction." ARMCANZ (2001). "Thickets can be up to several kilometres across" (van Rangelrooy & Flanagan, 1999). Serious impacts to aesthetics.	MH	MH
3. Injurious to people?	"Each leaf is subtended by a needle-sharp spine 5-15mm long" (Parsons & Cuthbertson, 1992). Thorns present at all times of the year.	MH	MH
4. Damage to cultural sites?	"Some colonies along rivers are many kilometres in length" (Parsons & Cuthbertson, 1992). Moderate visual effect.	ML	MH
Abiotic			
5. Impact flow?	Terrestrial species (Parsons & Cuthbertson, 1992). "Watercourse infestations can cause stream course alteration in subsequent floods by diverting the water flow contributing to erosion and inhibiting flood mitigation" (ARMCANZ, 2001). Weed may have a minor impact on surface or subsurface flow.	ML	MH
6. Impact water quality?	Terrestrial species (Parsons & Cuthbertson, 1992).	L	MH
7. Increase soil erosion?	"Watercourse infestations can cause stream course alteration in subsequent floods by diverting the water flow contributing to erosion and inhibiting flood mitigation" (ARMCANZ, 2001). High probability of large scale soil movement with major off-site implications. However, in Victoria, chance of flooding events is reduced.	MH	MH
8. Reduce biomass?	"It may form dense thickets" (Parsons & Cuthbertson, 1992). Where the plant occurs on open grassland, riverine or wetland areas biomass would increase significantly.	L	MH
9. Change fire regime?	No data available.	L	L
Community Habitat			
10. Impact on composition (a) high value EVC	EVC= Parilla Mallee (V); CMA=Mallee; Bioreg=Lowan Mallee; CLIMATE potential=VH. "Formation of thickets seriously affects ground vegetation through competition for light, water and nutrients." (ARMCANZ, 2001). Major displacement of some dominant species within the groundcover layer.	MH	MH
(b) medium value EVC	EVC= Riverine Chenopod woodland (D); CMA=Mallee; Bioreg=Murray Mallee; CLIMATE potential=VH. "Formation of thickets seriously affects ground vegetation through competition for light, water and nutrients." (ARMCANZ, 2001). Major displacement of some dominant species within the groundcover layer.	MH	MH
(c) low value EVC	EVC= Loamy Sands Mallee (LC); CMA=Mallee; Bioreg=Murray Mallee; CLIMATE potential=VH. "Formation of thickets seriously affects ground vegetation through competition for light, water and nutrients." (ARMCANZ, 2001). Major displacement of some dominant species within the groundcover layer.	MH	MH
11. Impact on structure?	"Formation of thickets seriously affects ground vegetation through competition for light, water and nutrients. It may in time displace trees such as the coolibah (<i>Eucalyptus microtheca</i>) and river red gum (<i>E. camaldulensis</i>)" (ARMCANZ, 2001). Major impact on <60% of the floral strata.	MH	MH

Impact Assessment Record

Scientific Name: *Parkinsonia aculeata* L.

Common name: Jerusalem thorn

QUESTION	COMMENTS	RANKING	CONFIDENCE
12. Effect on threatened flora?	No information found.	MH	L
Fauna			
13. Effect on threatened fauna?	No information found.	MH	L
14. Effect on non-threatened fauna?	“Infestations eliminate or reduce open water areas. These wetlands are waterbird habitats of national significance, as they provide refuges and breeding grounds and they may buffer against drought and habitat losses in other areas of Australia” (ARMCANZ, 2001). Reduction in habitat for fauna spp. leading to reduced populations.	MH	MH
15. Benefits fauna?	Birds and animals eat the seed, which enhances its germination capacity (Parsons & Cuthbertson, 1992). This suggests that fauna do not gain much from eating the seed.	H	MH
16. Injurious to fauna?	“Each leaf is subtended by a needle-sharp spine 5-15mm long” (Parsons & Cuthbertson, 1992). Thorns present at all times of the year.	MH	MH
Pest Animal			
17. Food source to pests?	Not documented in ARMCANZ (2001) as a food source to pest animals	L	MH
18. Provides harbor?	In Northern Australia, feral pigs use the thickets as harbour (ARMCANZ, 2001).	MH	MH
Agriculture			
19. Impact yield?	“Impedes access to water by stock; Reduces pasture production and carrying capacity lowering cattle and wool production” (ARMCANZ, 2001). Impact >5% reduction.	MH	MH
20. Impact quality?	Not documented in ARMCANZ (2001) to impact quality.	L	MH
21. Affect land value?	“All control programs require several years of follow-up treatments and many years of vigilance, which increases the cost several fold. The long-term costs may cause control of large dense infestations to be uneconomic. The current poor financial performance of agricultural industries and low land values of infested areas extenuate this” (ARMCANZ, 2001). As infestations may be uneconomical to control land value would drop further.	M	MH
22. Change land use?	See comments in 19 and 21 above. In time infested land may become useless for pastoral activities.	H	MH
23. Increase harvest costs?	“Increased difficulty and expense of mustering” (ARMCANZ, 2001). Increase in both time and labour.	M	MH
24. Disease host/vector?	None documented in ARMCANZ (2001).	L	MH

Impact Assessment Record

Scientific Name: *Parkinsonia aculeata* L.

Common name: Jerusalem thorn

References:

Agriculture and Resource Management Council of Australia & New Zealand (ARMCANZ), Australian & New Zealand Environment & Conservation Council and Forestry Ministers, (2001) *Weeds of National Significance Parkinsonia (Parkinsonia aculeata) Strategic Plan*. National Weeds Strategy Executive Committee, Launceston.

Parsons WT & Cuthbertson EG 1992, *Noxious Weeds of Australia*, Inkata Press, Melbourne and Sydney.

Thorp, JR & Lynch, R (2000) *The Determination of Weeds of National Significance*. National Weeds Strategy Executive Committee, Launceston.

van Rangelrooy, D.S., Flanagan, G.J. (1999). *Parkinsonia* (Parkinsonia aculeata). Agnote 569. Department of Business, Industry and Resource Development, Northern Territory.

Available: <http://www.nt.gov.au/dbird/dpif/pubcat/agnotes/weeds/569.pdf> Accessed: 14/07/03.

Invasiveness Assessment Record

Scientific name: *Pelargonium alchemilloides* L.

Common Name: garden geranium

QUESTION	COMMENTS	RATING	CONFIDENCE
Establishment			
1. Germination requirements?	"Late Autumn to winter" (CRC Weed Management, 2003). Natural seasonal disturbance.	MH	M
2. Establishment requirements?	"Has become a naturalised weed in peppermint woodland...and has the ability to invade intact vegetation" (CRC Weed Management, 2003). This suggests that it can establish under moderate canopy cover.	MH	M
3. How much disturbance is required?	"Often found in disturbed areas" (van der Walt, 1977), but has the ability to invade intact vegetation (CRC Weed Management, 2003). Establishes in relatively intact vegetation.	MH	M
Growth/Competitive			
4. Life form?	"Low, sprawling plant...[with] an underground tuber up to 6m in length" (CRC Weed Management, 2003). Geophyte.	ML	MH
5. Allelopathic properties?	No information found.	M	L
6. Tolerates herb pressure?	No information found.	M	L
7. Normal growth rate?	No information found.	M	L
8. Stress tolerance to frost, drought, w/logg, sal. etc?	"Can grow in...drought prone areas" (CRC Weed Management, 2003). No further information found. One study recorded garden geranium in more than 2/3 of unburnt treatment plots, but not recorded in burnt plots (Uys, Bond & Everson, 2004).	M	L
Reproduction			
9. Reproductive system	"Tuber (rhizome) or seed" (CRC Weed Management, 2003).	H	MH
10. Number of propagules produced?	"Prolific seed producer" (CRC Weed Management, 2003). Inflorescence may have up to 15 flowers (van der Walt, 1977) No further information found.	M	L
11. Propagule longevity?	"It is possible for seeds to remain viable in the soil for a long period of time" (CRC Weed Management, 2003). No further information found.	M	L
12. Reproductive period?	"A single plant will die out after a few years" (CRC Weed Management, 2003).	MH	M
13. Time to reproductive maturity?	"Flowering...follows the regrowth period" (CRC Weed Management, 2003) suggesting that garden geranium flowers in its second year.	MH	M
Dispersal			
14. Number of mechanisms?	Seeds appear suited to wind dispersal (photo in CRC Weed Management, 2003).	MH	M

Invasiveness Assessment Record

Scientific name: *Pelargonium alchemilloides* L.

Common Name: garden geranium

QUESTION	COMMENTS	RATING	CONFIDENCE
15. How far do they disperse?	No information found.	M	L

References cited:

CRC Weed Management *Weed Management Guide- garden geranium* – Pelargonium alchemilloides, CRC Weed Management, Australia.
van der Walt JJA 1977, *Pelargoniums of Southern Africa*, Purnell, Cape Town, Johannesburg, London.

Revisions

Date Revised by Revision

Present distribution of *Pelargonium alchemilloides* in Victoria

Scientific name: *Pelargonium alchemilloides* (L.) L'Hér.

Common name(s): garden geranium

Status:

Habitat:

Found in South Africa, Tanzania, Kenya, Somalia and Ethiopia in open grassland among rocks – 800 – 2000m (Exell *et al* 1963). Found in South Africa in climate ranges from Mediterranean in southwest to temperate in interior plateau and subtropical in northeast. Found in southwestern Western Australia along a roadside and in peppermint woodland (*Agonis flexuosa*) in a patchy distribution on sandy coastal soil. Average annual rainfall is 1000mm. (CRC for Australian Weed Management 2003).



Potential distribution of *Pelargonium alchemilloides* in Victoria

Scientific name: *Pelargonium alchemilloides* (L.) L'Hér.

Common name(s): garden geranium

Status:

Habitat:

Found in South Africa, Tanzania, Kenya, Somalia and Ethiopia in open grassland among rocks – 800 – 2000m (Exell *et al* 1963). Found in South Africa in climate ranges from Mediterranean in southwest to temperate in interior plateau and subtropical in northeast. Found in southwestern Western Australia along a roadside and in peppermint woodland (*Agonis flexuosa*) in a patchy distribution on sandy coastal soil. Average annual rainfall is 1000mm. (CRC for Australian Weed Management 2003).

Potential distribution produced from CLIMATE modelling refined by applying suitable landuse and vegetation type overlays with CMA boundaries

MAP OVERLAYS USED.

Land Use:

Pasture dryland
Pasture irrigation

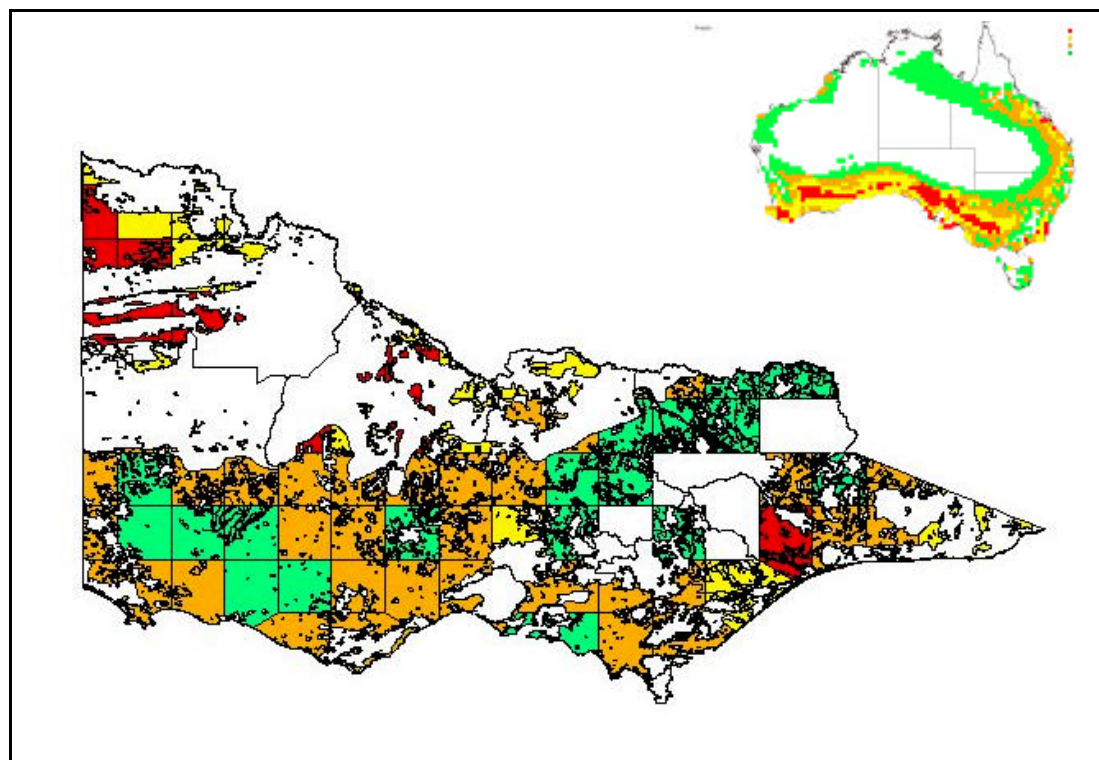
Broad vegetation types

Coastal scrubs and grassland; coastal grassy woodland; inland slopes woodland; dry foothill forest; montane dry woodland; grassland; plains grassy woodland; herb-rich woodland; montane grassy woodland; rainshadow woodland; mallee; boinka-raak; mallee woodland; Wimmera/mallee woodland

Colours indicate possibility of *Pelargonium alchemilloides* infesting these areas.

Red	= Very high	Yellow	= High
Orange	= Medium	Green	= Likely

In the non-coloured areas the plant is unlikely to establish as the climate, soil or landuse is not presently suitable.



Impact Assessment Record

Scientific Name: *Pelargonium alchemiloides* L.

Common name: garden geranium

QUESTION	COMMENTS	RATING	CONFIDENCE
Social			
1. Restrict human access?	Decumbent herb...usually 20cm tall (van der Walt, 1977). Will not restrict human access	L	MH
2. Reduce tourism?	This small, herbaceous species (van der Walt, 1977) is very unlikely to be obvious to the average visitor.	L	M
3. Injurious to people?	Silky leaves, no injurious properties noted in van der Walt (1977).	L	MH
4. Damage to cultural sites?	This small, herbaceous species (van der Walt, 1977) would have a negligible effect on aesthetics of cultural sites.	L	M
Abiotic			
5. Impact flow?	Habitats indicate that this is a terrestrial species (Kokwaro, 1971).	L	MH
6. Impact water quality?	Habitats indicate that this is a terrestrial species (Kokwaro, 1971).	L	MH
7. Increase soil erosion?	This plant can dominate understorey species and when it becomes dormant (CRC Weed Management, 2003) it could leave large bare patches of soil that has a moderate probability of large scale soil movement.	L	M
8. Reduce biomass?	The ability of this small plant (van der Walt, 1977) to dominate understorey species (CRC Weed Management, 2003) will decrease biomass as the smaller plant replaces larger ones.	MH	MH
9. Change fire regime?	The ability of this herbaceous plant (van der Walt, 1977) to dominate understorey species (CRC Weed Management, 2003) means that it has the potential to replace high fuel loads, such as grasses, with low fuel loads of herbaceous species. This could have a moderate effect on fire frequency and intensity.	MH	M
Community Habitat			
10. Impact on composition (a) high value EVC	EVC=Ridged Plains Mallee (E), CMA=Mallee, Bioreg.=Lowan Mallee, CLIMATE=VH. "Dominance of understorey species in the peppermint woodland" (CRC Weed Management, 2003). Major displacement of some dominant species within a layer.	MH	M
(b) medium value EVC	EVC=Semi-arid Woodland (D), CMA=Mallee, Bioreg.=Lowan Mallee, CLIMATE=VH. "Dominance of understorey species in the peppermint woodland" (CRC Weed Management, 2003). Major displacement of some dominant species within a layer.	MH	M
(c) low value EVC	EVC=Woorinen Sands Mallee (LC), CMA=Mallee, Bioreg.=Lowan Mallee, CLIMATE=VH. "Dominance of understorey species in the peppermint woodland" (CRC Weed Management, 2003). Major displacement of some dominant species within a layer.	MH	M
11. Impact on structure?	"Dominance of understorey species in the peppermint woodland" (CRC Weed Management, 2003). This plant has the potential for a major effect on the groundcover layer.	MH	M

Impact Assessment Record

Scientific Name: *Pelargonium alchemiloides* L.

Common name: garden geranium

QUESTION	COMMENTS	RATING	CONFIDENCE
12. Effect on threatened flora?	No information found.	MH	L
Fauna			
13. Effect on threatened fauna?	No information found.	MH	L
14. Effect on non-threatened fauna?	The ability of this plant to dominate understorey species (CRC Weed Management, 2003) means that it has the potential to reduce the food sources for fauna, leading locally to reduced numbers.	MH	M
15. Benefits fauna?	No information found.	M	L
16. Injurious to fauna?	Silky leaves, no injurious properties noted in van der Walt (1977).	L	MH
Pest Animal			
17. Food source to pests?	No information found.	M	L
18. Provides harbor?	This small, herbaceous species (van der Walt, 1977) is very unlikely to provide harbour for pest animals.	L	MH
Agriculture			
19. Impact yield?	“Not currently seen as a threat to agriculture, [but] it could have an impact on agricultural production...Could degrade pastoral areas.” Its ability to dominate understorey species (CRC Weed Management, 2003) and occurrence in grassland (Kokwaro, 1971) suggests that this plant has the potential to reduce the carrying capacity of pasture by more than 5%.	MH	MH
20. Impact quality?	This small, herbaceous species (van der Walt, 1977) is very unlikely to reduce the quality of produce.	L	MH
21. Affect land value?	This small, herbaceous species (van der Walt, 1977) is very unlikely to impact on land value.	L	MH
22. Change land use?	If infestations degraded pastoral areas enough to make them unprofitable (see Q 19), a change to cropping may be necessary.	MH	MH
23. Increase harvest costs?	Not predicted to be a weed of cropping (CRC Weed Management, 2003).	L	M
24. Disease host/vector?	Not noted as a disease host/vector in CRC Weed Management (2003).	L	M

Impact Assessment Record

Scientific Name: *Pelargonium alchemilloides* L.

Common name: garden geranium

References cited:

CRC Weed Management *Weed Management Guide- garden geranium* – *Pelargonium alchemilloides*, CRC Weed Management, Australia.

Kokwaro JO 1971 'The family Geraniaceae in Africa,' *Webbia* v. 25, p. 623-669.

van der Walt JJA 1977, *Pelargoniums of Southern Africa*, Purnell, Cape Town, Johannesburg, London.

Revisions

Date	Revised by	Revision

Invasiveness Assessment Record

Scientific name: *Pereskia aculeata* Mill.

Common Name: leaf cactus

QUESTION	COMMENTS	RATING	CONFIDENCE
Establishment			
1. Germination requirements?	“Germination generally occurs in the wetter winter and spring periods, providing there is not too much rain” (CRC Weed Management, 2003). Requires natural seasonal rainfall.	MH	M
2. Establishment requirements?	“Seedlings germinate readily in sunshine or in shade” (de Beer, 1988).	MH	H
3. How much disturbance is required?	“Forestry and conservation areas...amongst riparian vegetation along the banks of rivers...grows well in the subtropical eucalypt communities of southeastern Queensland” (CRC Weed Management, 2003). Invades forest margins and gaps, plantations (Henderson, 2001). Tends to establish in natural ecosystems that experience some disturbance.	MH	M
Growth/Competitive			
4. Life form?	“Shrubby to clambering vine” Henderson, 2001.	ML	MH
5. Allelopathic properties?	Not noted in CRC Weed Management (2003), de Beer (1988) or Moran & Zimmerman (1991).	L	M
6. Tolerates herb pressure?	“Heavily spined” (Moran & Zimmerman, 1991) in “closely spaced groups...make the infested area inaccessible” (de Beer, 1988) so this would prevent herbivory. Is subject to insect herbivory in South Africa through the introduction of biocontrol agents but these are South American species (Moran & Zimmerman, 1991).	H	MH
7. Normal growth rate?	“Grows quite vigorously in tropical and subtropical environments” (CRC Weed Management, 2003). “Reasonably vigorous...It overshadows all other vegetation and even big trees could collapse under the mass of the tangled branches” (de Beer, 1988). Growth rate has been observed to exceed most other species in the communities that it invades.	H	MH
8. Stress tolerance to frost, drought, w/logg, fire sal. etc?	“Drought tolerant...dislikes too much water.” Burning has been used to control this weed, but presumably it is not flammable because fresh material was burnt in oil drums (CRC Weed Management, 2003). Frost tolerant to -3°C (Faucon, 2005). Found in “dunes near the sea” (Leuenberger, 1986). Tolerant of at least 2 (drought, frost, salinity & fire) and susceptible to waterlogging.	MH	M
Reproduction			
9. Reproductive system	Seeds and stem pieces (de Beer, 1988).	H	MH
10. Number of propagules produced?	A picture of approximately 1 m ² of this plant shows about 400 flowers (Faucon, 2005). This plant can reach 12m and each fruit has a single seed (CRC Weed Management, 2003), so 12 x 400 = 4 800.	H	ML
11. Propagule longevity?	Reference to seed longevity was not found	M	L
12. Reproductive period?	Photographs of <i>Pereskia</i> from the Agricultural Research Council in South Africa (pers. comm.) show this plant forming dense monocultures.	H	MH

Invasiveness Assessment Record

Scientific name: *Pereskia aculeata* Mill.

Common Name: leaf cactus

QUESTION	COMMENTS	RATING	CONFIDENCE
13. Time to reproductive maturity?	"Local experience is that it needs to grow to 6 metres long before it will flower" (Perrin, 2003). Being "reasonably vigorous" (de Beer, 1988), you would expect the plant to reach this height in 2-5 years.	ML	ML
Dispersal			
14. Number of mechanisms?	"The fruit are eaten by birds...that spread the seeds to other areas" de Beer (1988). Pieces of the plant may be washed downstream a considerable distance" (CRC Weed Management, 2003).	H	MH
15. How far do they disperse?	"Pieces of the plant may be washed downstream a considerable distance...Birds can move propagules...a long way from gardens" (CRC Weed Management, 2003). It is very likely that some propagules will disperse more than 1km.	H	M

References cited:

CRC Weed Management 2003, *Weed Management Guide- Leaf cactus* – *Pereskia aculeata*, CRC Weed Management, Australia.

de Beer H 1988, 'Pereskia,' *Farming in South Africa, Weed Series*, Agricultural Research Council, South Africa.

Faucon P 2005, Desert Tropicals, Philippe and Sura Faucon, USA, Viewed: 12/10/2005, www.desert-tropicals.com/Plants/Cactaceae/Pereskia_aculeata.html

Henderson L 2001, *Alien Weeds and Invasive Plants*, Agricultural Research Council, South Africa.

Leuenberger, BE 1986, 'Pereskia (Cactaceae),' *Memoirs of the New York botanical Garden*, Vol. 41, p. 1-141.

Perrin N 2003, Cactus & Succulent Society of New Zealand- Wellington-Hutt Valley Branch, MSN Groups, USA viewed: 06/01/2006, <http://groups.msn.com/CactussucculentsocietyofNewZealandandWellingtonhuttV/latesthorokaka.msnw>.

Moran VC & Zimmermann HG 1991, 'Biological control of cactus weeds of minor importance in South Africa,' *Agriculture, Ecosystems and Environment*, vol. 37, p 37-55.

Revisions

Date Revised by Revision

Present distribution of *Pereskia aculeata* in Victoria

Scientific name: *Pereskia aculeata* Mill.

Common name(s): leaf cactus

Status:

Habitat:

Tropical and subtropical environments. Adapts to a wide variety of soil types but prefers well-drained, high-nutrient soils. Prefers light-shade environments. Invades forest margins and gaps and plantations (CRC for Australian Weed Management 2003) Rocky areas in mesophytic forest, from dry forest, restinga and dunes near the sea. Found on alluvial soils on diverse geological formations including igneous and calcareous rock (Leuenberger 1986).



Potential distribution of *Pereskia aculeata* in Victoria

Scientific name: *Pereskia aculeata* Mill.

Common name(s): leaf cactus

Status:

Habitat:

Tropical and subtropical environments. Adapts to a wide variety of soil types but prefers well-drained, high-nutrient soils. Prefers light-shade environments. Invades forest margins and gaps and plantations (CRC for Australian Weed Management 2003) Rocky areas in mesophytic forest, from dry forest, restinga and dunes near the sea. Found on alluvial soils on diverse geological formations including igneous and calcareous rock (Leuenberger 1986).

Potential distribution produced from CLIMATE modelling refined by applying suitable landuse and vegetation type overlays with CMA boundaries

MAP OVERLAYS USED.

Land Use:

Forest private plantation

Forest public plantation

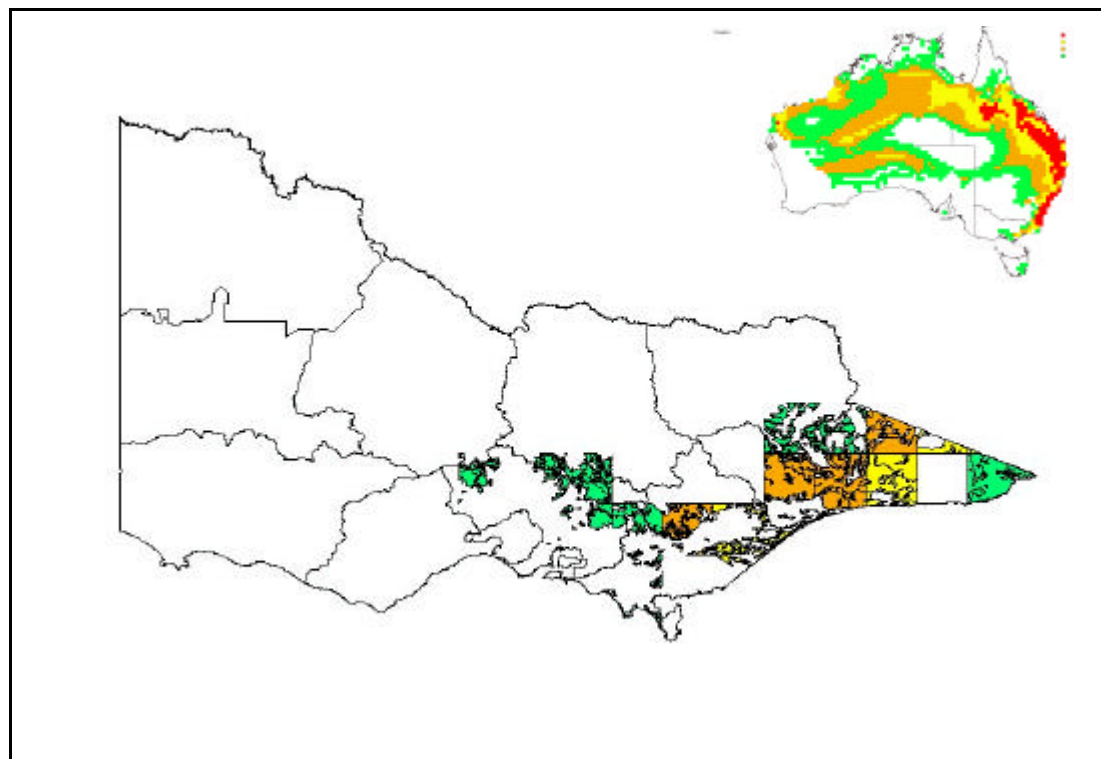
Broad vegetation types

Coastal grassy woodland; heathy woodland; lowland forest; sedge-rich woodland; dry foothill forest; moist foothill forest; plains grassy woodland; valley grassy forest; herb-rich woodland; riverine grassy woodland; riparian forest; rainshadow woodland.

Colours indicate possibility of *Pereskia aculeata* infesting these areas.

 Red	= Very high	 Yellow	= High
 Orange	= Medium	 Green	= Likely

In the non-coloured areas the plant is unlikely to establish as the climate, soil or landuse is not presently suitable.



Impact Assessment Record

Scientific Name: *Pereskia aculeata* Mill.

Common name: leaf cactus

QUESTION	COMMENTS	RATING	CONFIDENCE
Social			
1. Restrict human access?	"The plant has a tendency to form large impenetrable clumps and its extreme thorniness makes control of large infestations difficult...Growing amongst riparian vegetation along the banks of rivers in Queensland and New South Wales" (CRC Weed Management, 2003). "Runners...also spread along the ground to make the whole area inaccessible" (de Beer, 1988).	H	H
2. Reduce tourism?	Large, thorny, impenetrable thickets that are difficult to control and situated along riverbanks (see Q. 1) are likely to have a major impact on recreation in and around those rivers.	H	H
3. Injurious to people?	The main shoots vigorously bear curved spines 4-8mm long and 2-5mm thick and straight spines 10-35mm long and 0.5-1.5mm thick and trichomes 1-2mm long (Leuenberger, 1982).	H	H
4. Damage to cultural sites?	As a large, thorny climbing shrub that clambers over trees (Moran & Zimmermann, 1991) this plant has the capacity to detract visually from cultural sites.	ML	H
Abiotic			
5. Impact flow?	Terrestrial species that "dislikes too much water" (CRC Weed Management, 2003).	L	MH
6. Impact water quality?	Terrestrial species that "dislikes too much water" (CRC Weed Management, 2003).	L	MH
7. Increase soil erosion?	This plant can smother vegetation (de beer, 1988) that might otherwise bind soil. In cool or drought conditions this plant loses its leaves (Leuenberger, 1986) and where it has killed the vegetation it has smothered, it will leave the soil bare and prone to erosion. It can form major infestations along riverbanks (pers. comm. photo from the Agricultural Research Council (ARC) in South Africa) making the likelihood of flooding, and large scale soil movement with major offsite effects highly likely.	H	MH
8. Reduce biomass?	"Clambers over...trees...and may eventually kill them (Moran & Zimmermann, 1991).	H	H
9. Change fire regime?	Burning is used to control this weed in South Africa (CRC Weed Management, 2003) however this appears to have been by dropping plant pieces into oil drums. This indicates that it is not very flammable. In subtropical eucalypt communities it has the potential to reduce the incidence and intensity of fires.	MH	MH
Community Habitat			
10. Impact on composition (a) high value EVC	EVC= Foothill Box Ironbark Forest (V); CMA=East Gippsland; Bioreg= East Gippsland Upland; CLIMATE potential=H. . "Listed as a noxious weed in conservation areas in South Africa due to its formation of dense infestations" (CRC Weed Management, 2003). "It overshadows all other vegetation and even big trees could collapse under the mass of the tangled branches" (de Beer, 1988). Monoculture within the canopy layer.	H	MH
(b) medium value EVC	EVC= Riparian Forest (D); CMA=East Gippsland; Bioreg= East Gippsland Lowland; CLIMATE potential=H. "Listed as a noxious weed in conservation areas in South Africa due to its formation of dense	H	MH

Impact Assessment Record

Scientific Name: *Pereskia aculeata* Mill.

Common name: leaf cactus

QUESTION	COMMENTS	RATING	CONFIDENCE
	infestations" (CRC Weed Management, 2003). "It overshadows all other vegetation and even big trees could collapse under the mass of the tangled branches" (de Beer, 1988). Monoculture within the canopy layer.		
(c) low value EVC	EVC= Lowland Forest (Lc); CMA=East Gippsland; Bioreg= East Gippsland Lowland; CLIMATE potential=H "Listed as a noxious weed in conservation areas in South Africa due to its formation of dense infestations" (CRC Weed Management, 2003). "It overshadows all other vegetation and even big trees could collapse under the mass of the tangled branches" (de Beer, 1988). Monoculture within the canopy layer.	H	MH
11. Impact on structure?	"Listed as a noxious weed in conservation areas in South Africa due to its formation of dense infestations" (CRC Weed Management, 2003). "It overshadows all other vegetation and even big trees could collapse under the mass of the tangled branches" (de Beer, 1988). This vine has the capacity to form monocultures affecting all layers.	H	MH
12. Effect on threatened flora?	No information found.	MH	L
Fauna			
13. Effect on threatened fauna?	No information found.	MH	L
14. Effect on non-threatened fauna?	Dense infestations that smother native trees (CRC Weed Management, 2003) could reduce habitat and food for native fauna.	MH	MH
15. Benefits fauna?	"It bears ...edible fruits 25-45mm in diameter, which are popular with birds" (CRC Weed Management, 2003). Its thorny branches may also protect small birds from predation.	MH	MH
16. Injurious to fauna?	"Heavily spined" (Moran & Zimmermann, 1991).	H	H
Pest Animal			
17. Food source to pests?	May provide habitat and a food source for pest bird species (see Q. 15).	ML	MH
18. Provides harbor?	May provide harbor for small birds (see Q. 15).	ML	MH
Agriculture			
19. Impact yield?	"Listed as a noxious weed in forestry in South Africa due to its formation of dense infestations" (CRC Weed Management, 2003). It "climbers over...commercially planted forest trees...and may eventually kill them" (Moran & Zimmermann, 1991). Given how difficult this plant is to control (CRC Weed Management, 2003), this could have a major impact on quantity of produce.	MH	MH

Impact Assessment Record

Scientific Name: *Pereskia aculeata* Mill.

Common name: leaf cactus

QUESTION	COMMENTS	RATING	CONFIDENCE
20. Impact quality?	This plant is not noted as a weed of other agricultural systems in CRC Weed Management, (2003) and is not likely to impact on the quality of forestry products.	L	MH
21. Affect land value?	The labor-intensive nature of controlling this species, due to dense infestations that are thorny and that can regrow from stumps, leaf and stem fragments (CRC Weed Management, 2003), would probably reduce the value of badly infested land. Photographs from ARC in South Africa (pers. comm.) show extensive infestations that have entirely smothered acres of land.	H	MH
22. Change land use?	Commercial forests may no longer be viable in the presence of this weed (see Q. 19).	H	MH
23. Increase harvest costs?	The South African experience has shown that infestations are difficult to remove, involve meticulous human labor, and require “a great deal of follow-up treatment” (CRC Weed Management, 2003).	H	MH
24. Disease host/vector?	Not noted as a host for agricultural diseases (CRC Weed Management, 2003).	L	MH

References cited:

CRC Weed Management 2003, *Weed Management Guide- Leaf cactus* – *Pereskia aculeata*, CRC Weed Management, Australia.

de Beer H 1988, ‘*Pereskia*,’ *Farming in South Africa, Weed Series*, Agricultural Research Council, South Africa.

Leuenberger, BE 1986, ‘*Pereskia* (Cactaceae),’ *Memoirs of the New York botanical Garden*, Vol. 41, p. 1-141.

Moran VC & Zimmermann HG 1991, ‘Biological control of cactus weeds of minor importance in South Africa,’ *Agriculture, Ecosystems and Environment*, vol. 37, p 37-55.

Revisions

Date Revised by Revision

Invasiveness Assessment Record

Scientific name: *Piptochaetium montevidense* (Spreng.) Parodi

Common Name: Uruguayan rice grass

QUESTION	COMMENTS	RATING	CONFIDENCE
Establishment			
1. Germination requirements?	This species was successfully germinated in the temperate greenhouse at the Botanic Garden of the Institute of Botany in Graz (Austria, Europe), giving a “vague” impression of the conditions under which it was grown (Teppner, 2002). Not enough information was found to indicate germination requirements.	M	L
2. Establishment requirements?	Observed as a dominant understory species below Serrated tussock and Chilean needle grass in Argentina (David Maclaren, pers. comm.). Can establish under moderate canopy cover.	MH	MH
3. How much disturbance is required?	Disturbed grassland...it can also invade relatively undisturbed vegetation (CRC Weed Management, 2003b). A weed of crops, natural areas, roadsides and urban areas (Cunningham et al, 2003).	MH	M
Growth/Competitive			
4. Life form?	Perennial stipoid grass (Cunningham et al, 1993).	MH	MH
5. Allelopathic properties?	No evidence found. There is little information available about this species, so a medium value was chosen.	M	L
6. Tolerates herb pressure?	Resistant to grazing (CRC Weed Management, 2003a; Cunningham et al, 2003). Recorded as growing in a region of Brazil that has been grazed for the last 30 years by cattle, sheep and occasionally by horses (Maia et al, 2004). Unpalatable (David Maclaren, pers. comm.).	MH	H
7. Normal growth rate?	As an understory to <i>Nasella</i> spp. in Argentina (David Maclaren, pers. comm.). indicates that it doesn't grow as vigorously as these grasses, but no further information about its growth rate has been found.	M	L
8. Stress tolerance to fire, frost, drought, w/logg, sal. etc?	Burning stimulates development (heringer & Jacques, 2002). Maia et al (2004) found this plant associated with less wet habitats and uplands and intermediate sites. Focht & Pillar (2003) found the plant growing mainly in the dryer slopes (moist only after rain) of a Brazilian grassland site, but it still appeared in almost 40% of the wet lowland areas that were almost always moist (although at half the abundance of the drier sites). This is a major species from the Salado River Basin, an area that is subject to frequent flooding and severe summer droughts (Sala et al, 1981). In Victoria it was growing at Cherry Lake, near Altona (Cunningham et al, 1993), a site that is 400m from the saline Port Phillip Bay. A specimen of this plant was collected from 3400m up Chimborazo in Ecuador (Anon, 2005) at elevations that reach freezing in the Andes (Neill, 1999). The types of environments in which it is found suggests that <i>P. montevidense</i> is tolerant of drought, frost, salinity and waterlogging, and it appears to be tolerant of fire. It may not be susceptible to any of these stressors.	MH	H
Reproduction			
9. Reproductive system	Plants are bisexual with bisexual spikelets and hermaphrodite florets (Cunningham et al, 2003). No evidence of vegetative reproduction was found.	M	L
10. Number of propagules produced?	Produces many seeds. Although the exact volume or seed produced is unknown (CRC Weed Management, 2003a).	M	L

Invasiveness Assessment Record

Scientific name: *Piptochaetium montevidense* (Spreng.) Parodi

Common Name: Uruguayan rice grass

QUESTION	COMMENTS	RATING	CONFIDENCE
11. Propagule longevity?	No information found.	M	L
12. Reproductive period?	Dense sward (Cunningham et al, 2003), but this is not necessarily a monoculture. No further information was found.	M	L
13. Time to reproductive maturity?	Germinates Spring and Autumn, flowers Sept-Dec, seeds form in Dec & dropped by early Autumn (CRC Weed Management, 2003b). Reaches reproductive maturity in under one year.	H	M
Dispersal			
14. Number of mechanisms?	Dispersed by wind and also by browsing animals ingesting the plant and excreting the viable seed elsewhere...anecdotal evidence suggests that seeds are not carried or dispersed externally by stock (CRC Weed Management, 2003b).	MH	MH
15. How far do they disperse?	Animals digesting the seed have the potential to transport them several kilometres.	H	MH

References cited:

Anon. 2005, *Missouri Botanical Garden*, USA, viewed 30/08/2005, http://mobot.mobot.org/cgi-bin/search_vast.

CRC Weed Management 2003a, *Weed Management Guide: Uruguayan rice grass – Piptochaetium montevidense*, Australia.

CRC Weed Management 2003b, *CRC Weed Management*, Cooperative Research Centres Association, Canberra, viewed: 12/10/2005, www.weeds.crc.org.au/main/wom_uruguayan_0405.htm.

Cunningham DC, Woldendorp G, Burgess MB & Barry SC 1993, *Prioritising sleeper weeds for eradication*, Bureau of rural sciences, Australia.

Focht T & Pillar VD 2003, 'Spatial patterns and relations with site factors in a campos grassland under grazing,' *Brazilian Journal of Botany*, v. 63(3) p. 423-436.

Heringer, I & Jacques, AVA 2002, 'Burning and management alternatives non floristic composition of native pasture,' *The Scientific Journal of the Agricultural Centre*, Federal University of Santa Maria, Brazil, p. 315-321.

Maia FC, Medeiros RB, Pillar VP, Focht T 2004, 'Soil seed bank variation patterns according to environmental factors in a natural grassland,' *Revista Brasileira de Sementes*, vol. 26(2), p.126-137.

Neill DA 1999, Vegetation, p. 13-25, In: P.M. Jørgensen & S. León-Yáñez (eds.). Catalogue of the vascular plants of Ecuador. Monogr. Syst. Bot. Missouri Bot. Gard. 75.

Sala O, Deregibus VA, Schlichter T & Alippe H 1981, 'Productivity Dynamics of a Native Temperate Grassland in Argentina,' *Journal of Range Management* 34(1), p. 48-51.

Revisions

Date Revised by Revision

Present distribution of *Piptochaetium montevidense* in Victoria

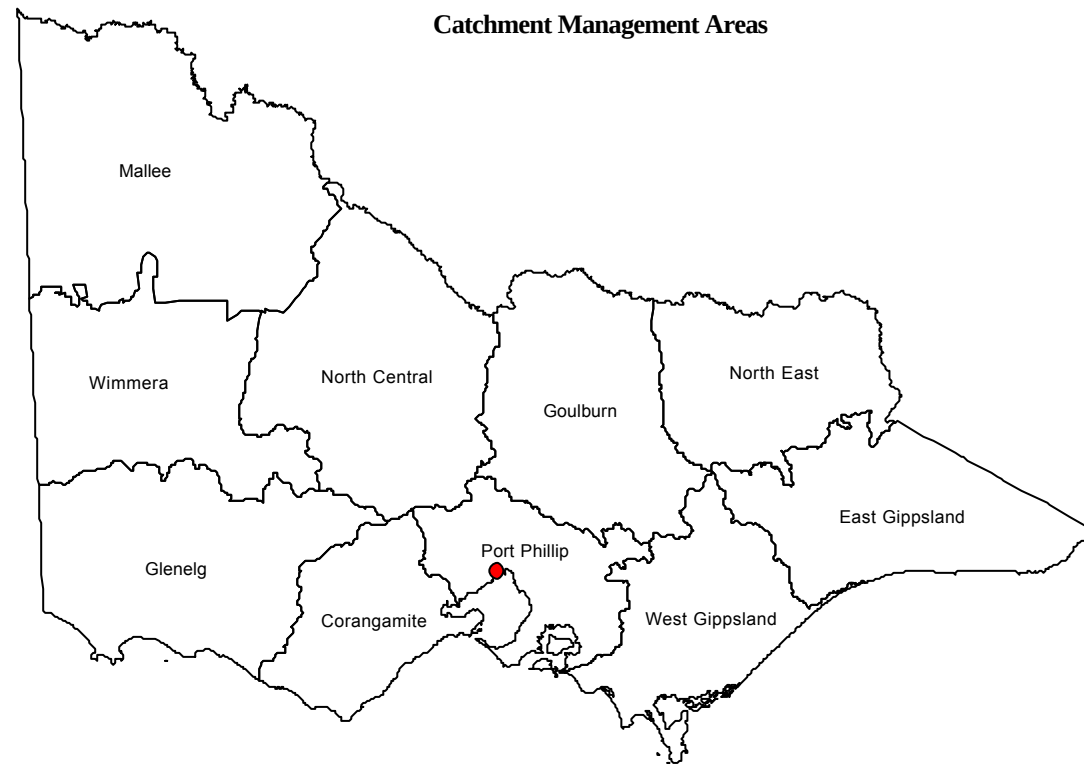
Scientific name: *Piptochaetium montevidense* (Spreng.) Parodi

Common name(s): Uruguayan rice grass

Status:

Habitat:

Temperate and subhumid climates. Prefers dry ground and will grow in crops, roads, streambanks, urban areas and natural environments such as grassy woodlands and lowland grasslands. (CRC for Australian Weed Management 2003)



Potential distribution of *Piptochaetium montevidense* in Victoria

Scientific name: *Piptochaetium montevidense* (Spreng.) Parodi

Common name(s): Uruguayan rice grass

Status:

Habitat:

Temperate and subhumid climates. Prefers dry ground and will grow in crops, roads, streambanks, urban areas and natural environments such as grassy woodlands and lowland grasslands. (CRC for Australian Weed Management 2003)

Potential distribution produced from CLIMATE modelling refined by applying suitable landuse and vegetation type overlays with CMA boundaries

MAP OVERLAYS USED.

Land Use:

Broadacre cropping
Pasture dryland

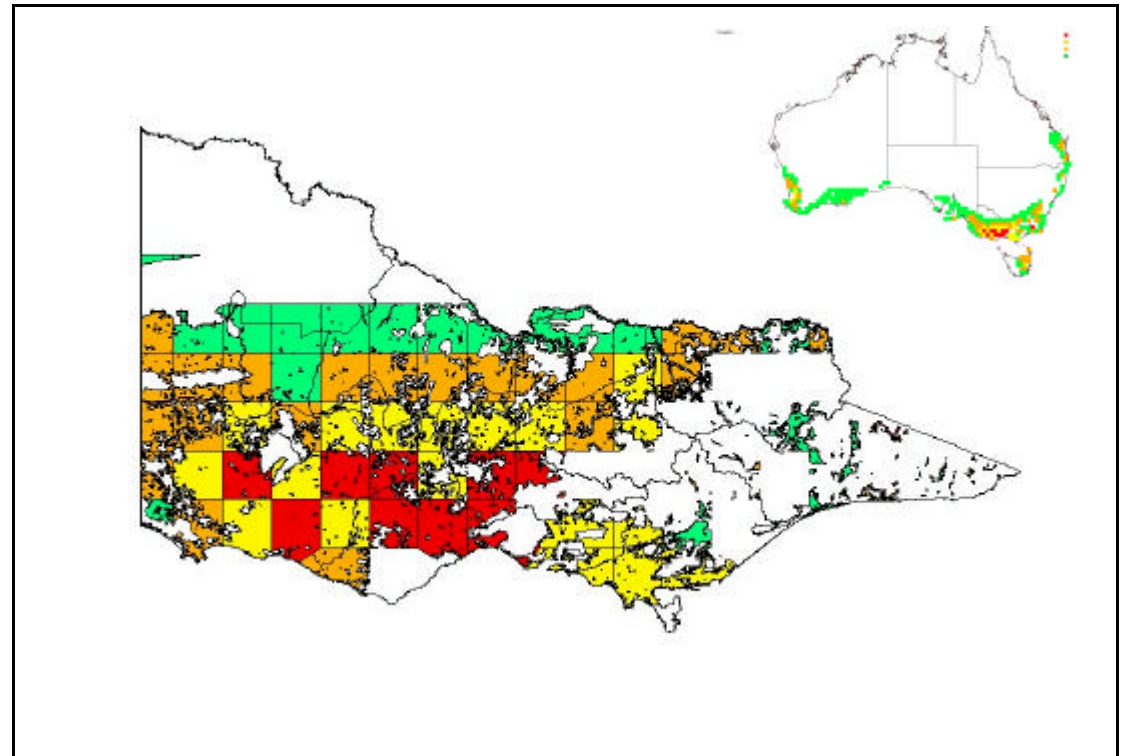
Broad vegetation types

Grassland; plains grassy woodland; valley grassy forest; riverine grassy woodland; riparian forest

Colours indicate possibility of *Piptochaetium montevidense* infesting these areas.

Red	= Very high	Yellow	= High
Orange	= Medium	Green	= Likely

In the non-coloured areas the plant is unlikely to establish as the climate, soil or landuse is not presently suitable.



Impact Assessment Record

Scientific Name: *Piptochaetium montevidense* (Spreng.) Parodi

Common name: Uruguayan rice grass

QUESTION	COMMENTS	RATING	CONFIDENCE
Social			
1. Restrict human access?	“Forms dense tussocks to about 0.5m high” (CRC Weed Management, 2003), which would not restrict human access.	L	MH
2. Reduce tourism?	“can be difficult to identify because of its similarity to native grasses and <i>Austrostipa</i> species” (CRC Weed Management, 2003). This weed would not be obvious to the average visitor.	L	MH
3. Injurious to people?	“The leaf blade is hairless but covered with minute rough projections” (CRC Weed Management, 2003), although these are not noted as sharp and so not likely to cause injury.	L	MH
4. Damage to cultural sites?	See Q. 2, as a “native-looking” grass, this species would not detract from cultural sites, nor damage structures.	L	MH
Abiotic			
5. Impact flow?	Whilst this plant does invade streambanks (CRC Weed Management, 2003), the only documented occurrence in wet environments was in seasonally flooded, or “always” moist areas, rather than permanent waterways. This makes it unlikely to impact on water flow.	L	H
6. Impact water quality?	See Q. 5, unlikely to impact on water quality.	L	H
7. Increase soil erosion?	As “a perennial that forms tussocks” (CRC Weed Management, 2003), this plant should not increase erosion as it would not cause patches of exposed bare soil as dormant or annual species might.	L	MH
8. Reduce biomass?	Similar habit to the dominant kangaroo grass (<i>Themeda triandra</i>) that it was found invading near Altona (CRC Weed Management, 2003; Albrecht et al (eds), 1991). Likely to replace tussock biomass in the grassland communities that it invades.	ML	MH
9. Change fire regime?	As it is similar in habit to the vegetation that it displaces (see Q. 8) and “stimulated by fire” (CRC Weed Management, 2003) this plant is unlikely to change the fire regime in the communities that it invades.	L	MH
Community Habitat			
10. Impact on composition (a) high value EVC	EVC= Plain grassy woodland (E); CMA=Corangamite; Bioreg= Victorian Volcanic Plain; CLIMATE potential=VH. Formed a “dense sward” (Cunningham et al, 2003) where it invaded grassland in Victoria. Major displacement of some dominant species in the groundcover layer.	MH	H
(b) medium value EVC	EVC= Lowland Forest (D); CMA=Corangamite; Bioreg= Otway Plain; CLIMATE potential=VH. Formed a “dense sward” (Cunningham et al, 2003) where it invaded grassland in Victoria, however the forest canopy would be likely to reduce its density. Minor displacement of some dominant species in the groundcover layer.	ML	H
(c) low value EVC	EVC= Lowland Forest (LC); CMA=Glenelg Hopkins; Bioreg= Warrnambool Plain; CLIMATE potential=VH. Formed a “dense sward” (Cunningham et al, 2003) where it invaded grassland in Victoria, however the forest canopy would be likely to reduce its density. Minor displacement of some dominant species in the groundcover layer.	ML	H

Impact Assessment Record

Scientific Name: *Piptochaetium montevidense* (Spreng.) Parodi

Common name: Uruguayan rice grass

QUESTION	COMMENTS	RATING	CONFIDENCE
11. Impact on structure?	Formed a “dense sward” (Cunningham et al, 2003) where it invaded grassland in Victoria. It has the potential to have a major impact on ground flora. Its ability to affect the germination of flora from other strata is not known.	MH	H
12. Effect on threatened flora?	No Information found.	MH	L
Fauna			
13. Effect on threatened fauna?	No Information found.	MH	L
14. Effect on non-threatened fauna?	Has the potential to reduce the availability of ground flora as fodder (see Q. 11.) and is “resistant to grazing” so could reduce food sources where it invades, forcing some species to forage elsewhere.	MH	MH
15. Benefits fauna?	See Q.14- would provide little food for desirable species.	MH	MH
16. Injurious to fauna?	Despite its resemblance and close association to Chilean needle grass, the seeds on this grass are not sharp and barbed (see illustration CRC Weed Management, 2003). Not noted for toxicity.	L	MH
Pest Animal			
17. Food source to pests?	“Resistant to grazing” (CRC Weed Management, 2003) so not likely to provide a significant food source to pests.	L	MH
18. Provides harbor?	As a perennial that “forms dense tussocks to about 0.5m high,” (CRC Weed Management, 2003) this grass may provide harbor for entrances to rabbit warrens.	MH	MH
Agriculture			
19. Impact yield?	In Argentina this plant is a dominant understorey to Chilean needle grass and serrated tussock (David Maclaren, pers. comm.) indicating that it has the potential to form a significant component of invaded grassland. As a grassland invader that is resistant to grazing (CRC Weed Management, 2003), this tussock may displace stock fodder, reducing the carrying capacity of the land. The degree of impact is unknown, so a medium value was chosen.	M	L

Impact Assessment Record

Scientific Name: *Piptochaetium montevidense* (Spreng.) Parodi

Common name: Uruguayan rice grass

QUESTION	COMMENTS	RATING	CONFIDENCE
20. Impact quality?	Despite its resemblance and close association to Chilean needle grass, the seeds on this grass are not sharp and barbed (see illustration CRC Weed Management, 2003), so it doesn't pose a meat contamination risk. The plant "will grow in crops" (CRC Weed Management, 2003) however, which may impact quality, however, again the degree of impact is unknown, so a medium value was chosen.	M	L
21. Affect land value?	Affect on land value will depend on level of infestation and ease of control, both of which are unknowns for this species.	M	L
22. Change land use?	Change in land use may occur if the carrying capacity of pasture is significantly reduced or if crop quality is too badly affected. Without any indication of the potential degree of impact, a medium value was chosen	M	L
23. Increase harvest costs?	Harvest costs may be increased if a large degree of weed control is necessary.	M	L
24. Disease host/vector?	Not known as a disease host or vector, however there is not much information about this species.	L	L

References cited:

CRC Weed Management 2003, *Weed Management Guide- Piptochaetium montevidense*- Uruguayan rice grass, CRC Weed Management, Australia.

Cunningham DC, Woldendorp G, Burgess MB & Barry SC 1993, *Prioritising sleeper weeds for eradication*, Bureau of rural sciences, Australia.

Albrecht D, Colville B, Entwisle T, Jones D, Lorimer G, Mattingley G & Weste G (eds.) 1991, *Flora of Melbourne*, Society for Growing Australian Plants Maroondah, inc.

Revisions

Date Revised by Revision

Invasiveness Assessment Record

Scientific name: *Praxelis clematidea* R. M. King & H. Rob

Common Name: praxelis

QUESTION	COMMENTS	RATING	CONFIDENCE
Establishment			
1. Germination requirements?	“Most germination occurs following rainfall, but it can occur year round under suitable conditions (eg in gardens, irrigated pasture)” (CRC Weed Management, 2003).	H	M
2. Establishment requirements?	“Able to invade the understorey of relatively undisturbed woodlands” (Waterhouse, 2003). Tolerates part shade to full sun but does not cope well under heavy shade (CRC Weed Management, 2003). Can establish under moderate canopy cover.	MH	H
3. How much disturbance is required?	“Able to invade the understorey of relatively undisturbed woodlands.” Also invades roadsides, streambanks, pastures, sugarcane etc., (Waterhouse, 2003).	MH	H
Growth/Competitive			
4. Life form?	“Annual or short-lived perennial herb” (Waterhouse, 2003).	L	H
5. Allelopathic properties?	None found	L	L
6. Tolerates herb pressure?	“Not eaten by stock” (Pollock et al, 2004)	H	MH
7. Normal growth rate?	“It can grow up to c. 1.2m tall but most plants are c. 40-80cm” (Csurhes, 1998), which is an average height for an annual or short-lived perennial.	MH	MH
8. Stress tolerance to frost, drought, w/logg, sal. etc?	Frost resistance (Waterhouse, 2003). Rapidly colonises bare earth after fire (CRC Weed Management, 2003) although this is probably by seed. “Woody rhizome protects from fire” (anon, 2004). Not noted as growing in permanently wet conditions, although it does “grow vigorously along riverbanks” which is the type of environment it would likely be found in “areas where annual rainfall is less than 500mm” (CRC Weed Management, 2003), suggesting low drought tolerance. Exhibits some frost and fire resistance, but not waterlogging or drought.	ML	M
Reproduction			
9. Reproductive system	“Mainly spreads by seeds...Roots and new plantlets form along branches in contact with soil” (CRC Weed Management, 2003).	H	M
10. Number of propagules produced?	“Can produce large numbers of seeds.” Each inflorescence has 30 - 50 florets. Sixteen florets appear on one stem, with 5 flowering stems on one plant, as pictured in CRC Weed Management (2003). 50 x 16 x 5 = 4000.	H	M
11. Propagule longevity?	No data found	M	L
12. Reproductive period?	“Forms monospecific stands, excluding other vegetation (PIER, 2005).	H	MH
13. Time to reproductive maturity?	Already flowering in its first season (Veldkamp, 1999).	H	H

Invasiveness Assessment Record

Scientific name: *Praxelis clematidea* R. M. King & H. Rob

Common Name: praxelis

QUESTION	COMMENTS	RATING	CONFIDENCE
Dispersal			
14. Number of mechanisms?	Airborne seed dispersal seems to be effective over short distances (Waterhouse, 2003). Pappus assists dispersal also by water, or by attaching to fur or feathers (CRC Weed Management, 2003).	MH	MH
15. How far do they disperse?	As this plant “grows vigorously along riverbanks” and its seed can be dispersed by water (CRC Weed Management, 2003), many propagules would be likely to reach 200-1000m but few will disperse greater than 1km. “Airborne seed dispersal seems to be effective over short distances” (Waterhouse, 2003).	MH	MH

References cited:

Anon 2004, *COOKShire*, Queensland Government, Australia, viewed: 09/01/2006, <http://www.cook.qld.gov.au/council/publications/COOKSC-Pest> Management Plan.pdf.

CRC Weed Management 2003, *Weed Management Guide: Praxelis*- *Praxelis clematidea*, CRC Weed Management, Australia.

Csurhes S & Edwards R 1998, *Potential Environmental Weeds in Australia, Candidate Species for Preventative Control*, Biodiversity Group, Environment Australia, Canberra, ACT.

Pacific Island Ecosystems at Risk (PIER), 2005, *Hawaiian Ecosystems at Risk project (HEAR)*, US Geological Survey, USA, viewed: 12/10/2005, www.hear.org/pier/species/praxelis_clematidea.htm.

Pollock S, Holland A & Smith W 2004, *New alien weed for Queensland: Praxelis. Queensland herbarium alert sheet*, Environmental Protection Agency, Queensland.

Veldkamp, JF 1999, ‘*Eupatorium catarium*, a New Name for *Eupatorium clematideum* Griseb., non Shc.Bip. (Compositae), a South American species Naturalized and Spreading in SE Asia and Queensland, Australia,’ *Gardens’ Bulletin Singapore*, Vol. 51, p. 119-124.

Waterhouse, B. M. 2003. Know your enemy: recent records of potentially serious weeds in northern Australia, Papua New Guinea and Papua (Indonesia). *Telopea* 10(1):483.

Revisions

Date Revised by Revision

Present distribution of *Praxelis clematidea* in Victoria

Scientific name: *Praxelis clematidea* R.M. King & H. Rob

Common name(s): praxelis

Status:

Habitat:

Roadsides, railway lines, disturbed areas, urban wasteland, beneath fences, rural paths; altitude 0-700 m in Hong Kong, 0-800 m in Queensland; 350 – 3050 m in South America (Veldkamp 1999). Survives a wide range of soil types. Invades grasslands and particularly over-grazed pastures. Found in open eucalypt woodlands and grows vigorously along riverbanks. Can survive some exposure to frost. (CRC for Australian Weed Management 2003).



Potential distribution of *Praxelis clematidea* in Victoria

Scientific name: *Praxelis clematidea* R.M. King & H. Rob

Common name(s): praxelis

Status:

Habitat:

Roadsides, railway lines, disturbed areas, urban wasteland, beneath fences, rural paths; altitude 0-700 m in Hong Kong, 0-800 m in Queensland; 350 – 3050 m in South America (Veldkamp 1999). Survives a wide range of soil types. Invades grasslands and particularly over-grazed pastures. Found in open eucalypt woodlands and grows vigorously along riverbanks. Can survive some exposure to frost. (CRC for Australian Weed Management 2003).

Potential distribution produced from CLIMATE modelling refined by applying suitable landuse and vegetation type overlays with CMA boundaries

MAP OVERLAYS USED.

Land Use:

Broadacre cropping
Forest private / public plantation
Pasture dryland / irrigation

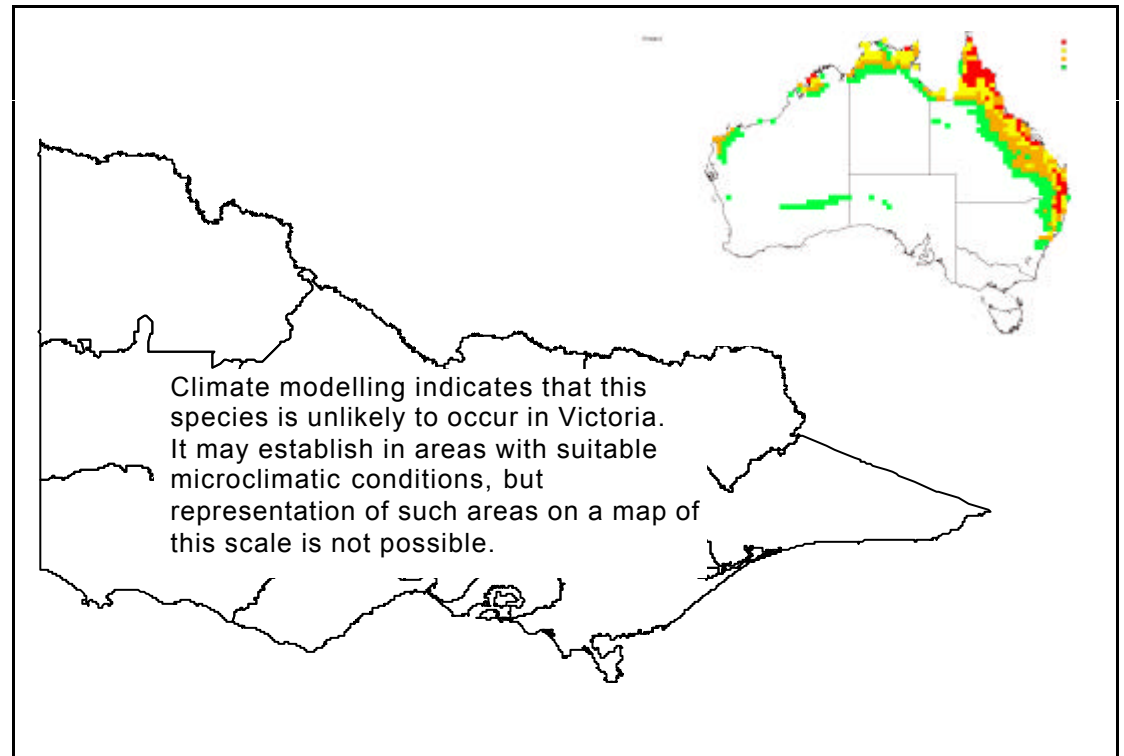
Broad vegetation types

Coastal grassy woodland; riverine grassy woodland

Colours indicate possibility of *Praxelis clematidea* infesting these areas.

Red	= Very high	Yellow	= High
Orange	= Medium	Green	= Likely

In the non-coloured areas the plant is unlikely to establish as the climate, soil or landuse is not presently suitable.



Impact Assessment Record

Scientific Name: *Praxelis clematidea* R. M. King & H. Rob.

Common name: praxelis

QUESTION	COMMENTS	RATING	CONFIDENCE
Social			
1. Restrict human access?	“Annual or short-lived perennial herb” (Waterhouse, 2003). “It can grow up to c. 1.2m tall but most plants are c. 40-80cm” (Csurhes, 1998). They have brittle stems (CRC Weed Management, 2003). Infestations of <i>Praxelis</i> would not impede pedestrian access as the plants would be easily pushed aside or crushed underfoot.	L	MH
2. Reduce tourism?	“When crushed they [the leaves] emit a pungent odour similar to cat’s urine” (CRC Weed Management, 2003). “Unpleasant-smelling, softly-hairy herb, 20-80cm tall...The flower colour is light violet...but can appear blue to purple” (Corlett & Shaw, 1995). “Forms monospecific stands, excluding other vegetation” (PIER, 2005). Flowering generally occurs from November to May but some flowers may appear at any time of the year (CRC Weed management, 2003). The brightly coloured flowers could be obvious to most visitors for much of the year and the smell would be off-putting to many people, but the presence of this weed would be unlikely to inhibit activity.	ML	MH
3. Injurious to people?	“Anecdotal reports suggest that it may be poisonous to...humans if ingested” (Veldkamp, 1999) but there was no further record of the plant’s ability to injure people (CRC Weed Management, 2003). However, it is unlikely to be ingested.	ML	MH
4. Damage to cultural sites?	The brightly coloured flowers could have a moderate visual effect for much of the year (see description from Q. 2).	ML	MH
Abiotic			
5. Impact flow?	“Grows vigorously along riverbanks” (CRC Weed Management, 2003), but there is no evidence that it invades the water.	L	M
6. Impact water quality?	See Q. 5.	L	M
7. Increase soil erosion?	“Can become the dominant herbaceous plant in open eucalypt woodlands.” In drier areas <i>Praxelis</i> dies off until the next rainy season and also “grows vigorously along riverbanks” (CRC Weed Management, 2003). There is the potential for large areas of soil to become bare when <i>Praxelis</i> dies off and with heavy rain and/or flooding of waterways, large scale soil movement is likely with major offsite implications.	H	M
8. Reduce biomass?	As this plant can “become the dominant herbaceous plant in open eucalypt woodlands” and can seasonally die off in drier areas (CRC Weed Management, 2003), biomass may be slightly decreased where there was once a more permanent herbaceous cover.	MH	M
9. Change fire regime?	This species is not noted for changes to fire regime. As an herbaceous annual or short-lived perennial that can invade grasslands (CRC Weed Management, 2003), it may reduce fuel load and flammability, thereby reducing the frequency and/or intensity of fires in these communities. Elsewhere, where it replaces similar vegetation it is likely to have little effect.	ML	M
Community Habitat			
10. Impact on composition (a) high value EVC	Climate modelling shows that this species is not likely to occur as an invasive plant in Victoria.	L	H

Impact Assessment Record

Scientific Name: *Praxelis clematidea* R. M. King & H. Rob.

Common name: praxelis

QUESTION	COMMENTS	RATING	CONFIDENCE
(b) medium value EVC	Climate modelling shows that this species is not likely to occur as an invasive plant in Victoria.	L	H
(c) low value EVC	Climate modelling shows that this species is not likely to occur as an invasive plant in Victoria.	L	H
11. Impact on structure?	Its ability to “become the dominant herbaceous plant in open eucalypt woodlands” (CRC Weed Management, 2003) could have a major effect on ground level vegetation.	MH	M
12. Effect on threatened flora?	Climate modelling shows that this species is not likely to occur as an invasive plant in Victoria.	L	H
Fauna			
13. Effect on threatened fauna?	Climate modelling shows that this species is not likely to occur as an invasive plant in Victoria.	L	H
14. Effect on non-threatened fauna?	“It can become the dominant herbaceous plant in open eucalypt woodlands” (CRC Weed Management, 2003). It is “not eaten by stock” (Pollock et al, 2004) and if this is true for other fauna it may reduce access to food, forcing them to seek food elsewhere.	MH	M
15. Benefits fauna?	“There is some evidence that it may be poisonous to stock...if ingested” (CRC Weed Management, 2003), so it is unlikely to provide a food source for fauna and as an “annual or short-lived perennial herb” (Waterhouse, 2003) to 40-80cm (Csurhes, 1998), would not provide much shelter either.	H	M
16. Injurious to fauna?	“There is some evidence that it may be poisonous to stock...if ingested” (CRC Weed Management, 2003), so it may be poisonous to fauna when present.	MH	M
Pest Animal			
17. Food source to pests?	Toxicity (CRC Weed Management, 2003) probably precludes this plant from being a food source to pests.	L	MH
18. Provides harbor?	As an “annual or short-lived perennial herb” (Waterhouse, 2003) to 40-80cm (Csurhes, 1998), this plant would not offer much shelter.	L	MH
Agriculture			
19. Impact yield?	“Forms monospecific stands, excluding other vegetation” (PIER, 2005), “not eaten by stock” (Pollock et al, 2004). “An abundant weed of...pastures...it encroaches upon sugarcane plantations and other cultivated areas (Waterhouse, 2003). “In Hong Kong and mainland China...it appears set to become a significant weed of dryland agriculture...There is some evidence that it may be poisonous to stock...if ingested” (CRC Weed Management, 2003). Large infestations may significantly reduce the carrying capacity of pasture by forming poisonous monocultures and may reduce crop yields by encroachment.	MH	H

Impact Assessment Record

Scientific Name: *Praxelis clematidea* R. M. King & H. Rob.

Common name: praxelis

QUESTION	COMMENTS	RATING	CONFIDENCE
20. Impact quality?	It is postulated that it was introduced to north Queensland as “a contaminant of pasture seeds imported from Brazil” (Waterhouse, 2003) and this suggests that it would be unlikely to be identified as reducing the quality of pasture seed crops. Whilst it invades other crops (CRC Weed Management, 2003) its bright flower colour (Corlett & Shaw, 1995) would make an infestation obvious and able to be avoided during harvest.	L	MH
21. Affect land value?	Reduced productivity may affect land value, see Q. 19, but probably not by more than 10%	MH	MH
22. Change land use?	Increased costs of harvest (see Q. 23) and reduced quality of produce (see Q. 20) may make stocking and/or cropping less viable on infested land.	MH	MH
23. Increase harvest costs?	“Could threaten, and significantly increase the costs of managing, such crops as bananas, other fruits and sugar cane” (CRC Weed Management, 2003).	H	M
24. Disease host/vector?	Not noted as a disease host or vector in CRC Weed Management, 2003.	L	M

References cited:

Corlett RT and Shaw JC 1995, ‘*Praxelis clematidea*: yesterday South America, today Hong Kong, tomorrow the world?’ *Memoirs of the Hong Kong Natural History Society* vol. 20, p. 235-236

CRC Weed Management 2003, *Weed Management Guide: Praxelis- Praxelis clematidea*, CRC Weed Management, Australia.

Csurhes S & Edwards R 1998, *Potential Environmental Weeds in Australia, Candidate Species for Preventative Control*, Biodiversity Group, Environment Australia, Canberra, ACT.

Pacific Island Ecosystems at Risk (PIER), 2005, *Hawaiian Ecosystems at Risk project (HEAR)*, US Geological Survey, USA, Viewed: 12/10/2005,

www.hear.org/pier/species/praxelis_clematidea.htm.

Pollock S, Holland A, Smith W 2004, *New alien weed for Queensland: Praxelis. Queensland herbarium alert sheet*, Environmental Protection Agency, Queensland.

Waterhouse, B.M 2003. Know your enemy: recent records of potentially serious weeds in northern Australia, Papua New Guinea and Papua (Indonesia). *Telopea* 10(1): 483.

Revisions

Date Revised by Revision

Invasiveness Assessment Record

Scientific name: *Retama raetam* (Forssk.) Webb

Common Name: white weeping broom

QUESTION	COMMENTS	RATING	CONFIDENCE
Establishment			
1. Germination requirements?	“Seeds mainly germinate in autumn, but can germinate year round under suitable conditions” (CRC Weed Management, 2003).	H	M
2. Establishment requirements?	Invading she-oak woodlands on the Eyre Peninsula and may infest grazing land (CRC Weed Management, 2003). This suggests that it can establish under moderate canopy.	MH	M
3. How much disturbance is required?	Infests grazing land and invades deserts and grasslands, sheoak woodlands (CRC Weed Management, 2003), stabilized and semi-mobile dunes (Izhaki & Ne’eman, 1997). These ecosystems tend to be minor to highly disturbed.	MH	M
Growth/Competitive			
4. Life form?	Legume (Pnueli et al, 2002).	MH	H
5. Allelopathic properties?	None recorded	L	L
6. Tolerates herb pressure?	“Poisonous and unpalatable” (El-bana et al, 2003). “Cut plants resprout vigorously” CRC Weed Management. However, it is listed as a palatable species in d’Arces, 1961.	H	H
7. Normal growth rate?	Observed growing at 1’ (30cm) or less per year (Johnson, 2005) which is fairly slow for a shrub.	ML	MH
8. Stress tolerance to frost, drought, w/logg, sal. etc?	“Extreme drought tolerance” (Pnueli et al, 2002). Halophytic (Liang & Steinberger, 2001). Frost tolerant to at least -9°C but killed by waterlogging (Johnson, 2005). “Fire effectively kills plants...but lightly scorched plants may resprout” (CRC Weed Management, 2003). High tolerance to drought and frost, moderate fire and salt tolerance. Not tolerant of waterlogging.	MH	MH
Reproduction			
9. Reproductive system	Seed. Flower is closed (see picture in CRC Weed Management, 2003), and attract insects (Whitinger, 2006) suggesting cross-pollination is required.	L	M
10. Number of propagules produced?	“Up to thousands of seeds on larger plants” (CRC Weed Management, 2003).	H	M
11. Propagule longevity?	“Several years...A hard seed coat renders most seeds dormant initially” (CRC Weed Management, 2003). No specific information found.	M	L
12. Reproductive period?	Recorded as fruiting over a period of at least 3 years (Johnson, 2005).	MH	MH
13. Time to reproductive maturity?	Recorded as fruiting 5 years after planting (Johnson, 2005).	ML	MH
Dispersal			
14. Number of mechanisms?	Water (CRC Weed Management, 2003). Ingested by hares (recorded as carry seeds >10m from parent plant), whose digestive processes stimulate germination (Izhaki & Ne’eman, 1997).	MH	M

Invasiveness Assessment Record

Scientific name: *Retama raetam* (Forssk.) Webb

Common Name: white weeping broom

QUESTION	COMMENTS	RATING	CONFIDENCE
15. How far do they disperse?	Many seeds could be transported by hares (Izhaki & Ne'eman, 1997) 200 –1000m.	MH	H

References cited:

CRC Weed Management 2003, *Weed Management Guide- White weeping broom - Retama raetam*, CRC Weed Management, Australia.

Csurhes S & Edwards R 1998, *Potential Environmental Weeds in Australia, Candidate Species for Preventative Control*, Biodiversity Group, Environment Australia, Canberra, ACT.

El-Bana M, Jijs I & Khedr AA 2003, 'The importance of Phytogenic Mounds (Nebkhas) for Restoration of Arid Degraded Rangelands in Northern Sinai,' *Resoration Ecology*, vol. 11(3), p. 317-324.

d'Arces PJ 1961, 'A contribution to the study of sheep-feeding in Algeria,' *C. R. Acad. Agric. Fr.*, vol 47(12). P. 630-7.

Johnson MB 2005, *Desert Legume Program*, University of Arizona College of Agriculture and Life Sciences, and the Boyce Thompson Southwestern Arboretum, Arizona, viewed: 29/12/2005, <http://cals.arizona.edu/desertlegumeprogram/pdf/Survival.pdf>.

Liang W & Steinberger Y 2001, 'Temporal changes in nematode community structure in a desert ecosystem,' *Journal of Arid Environments*, Vol. 48(3), p. 267-280.

Pnueli L, Hallak-Herr E, Rozenberg M, Cohen M, Goloubinoff P, Kaplan A & Mittler R 2002, 'Molecular and biochemical mechanisms associated with dormancy and drought tolerance in the desert legume *Retama raetam*,' *The Plant Journal* Vol. 31(3), p. 319-330.

Whiting D 2006 *Detailed information on White Weeping Broom, Portugese Broom (Retama raetam)*, Dave's Garden, Bryan/College Station, Texas, USA, viewed: 02/01/2006, <http://davesgarden.com/pf/go/72774/index.html>.

Revisions

Date Revised by Revision

Present distribution of *Retama raetam* in Victoria

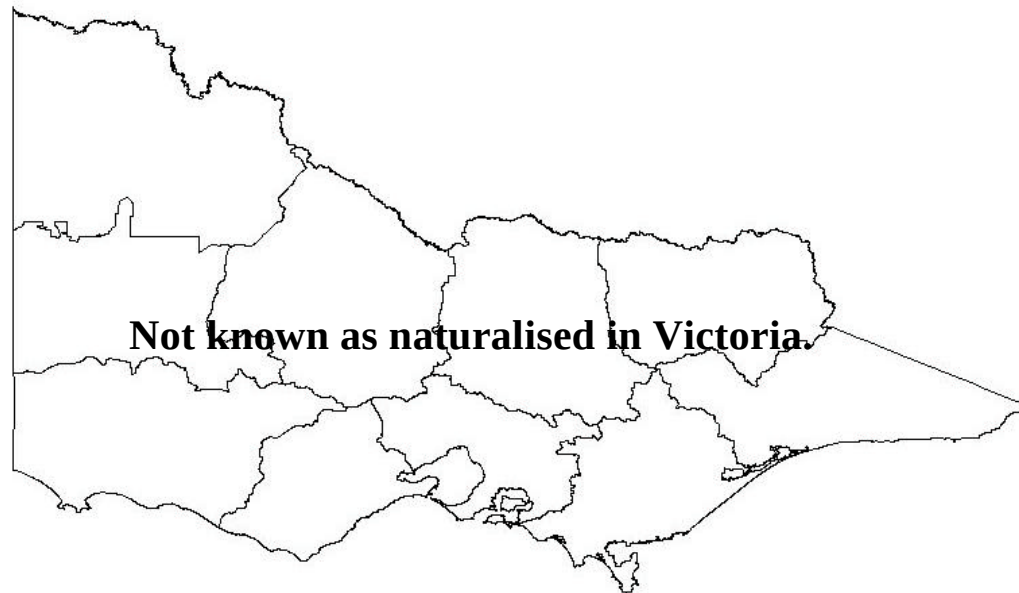
Scientific name: *Retama raetam* (Forssk.) Webb & Berthel.

Common name(s): white weeping broom

Status:

Habitat:

Common in semi-arid and arid ranges of Southern Tunisia, Southern Algeria and the Middle East. Grows in calcareous soils and general habitat is dune massifs, ergs and wadis (El Bahri *et al* 1999). Found in Mediterranean grasslands, Sahara grasslands and Sahara desert (ILDIS 2005). Invades nutrient-poor to fertile, well-drained soils (CRC for Australian Weed Management 2003).



Potential distribution of *Retama raetam* in Victoria

Scientific name: *Retama raetam* (Forssk.) Webb & Berthel.

Common name(s): white weeping broom

Status:

Habitat:

Common in semi-arid and arid ranges of Southern Tunisia, Southern Algeria and the Middle East. Grows in calcareous soils and general habitat is dune massifs, ergs and wadis (El Bahri *et al* 1999). Found in Mediterranean grasslands, Sahara grasslands and Sahara desert (ILDIS 2005). Invades nutrient-poor to fertile, well-drained soils (CRC for Australian Weed Management 2003).

Potential distribution produced from CLIMATE modelling refined by applying suitable landuse and vegetation type overlays with CMA boundaries

MAP OVERLAYS USED.

Land Use:

Pasture dryland

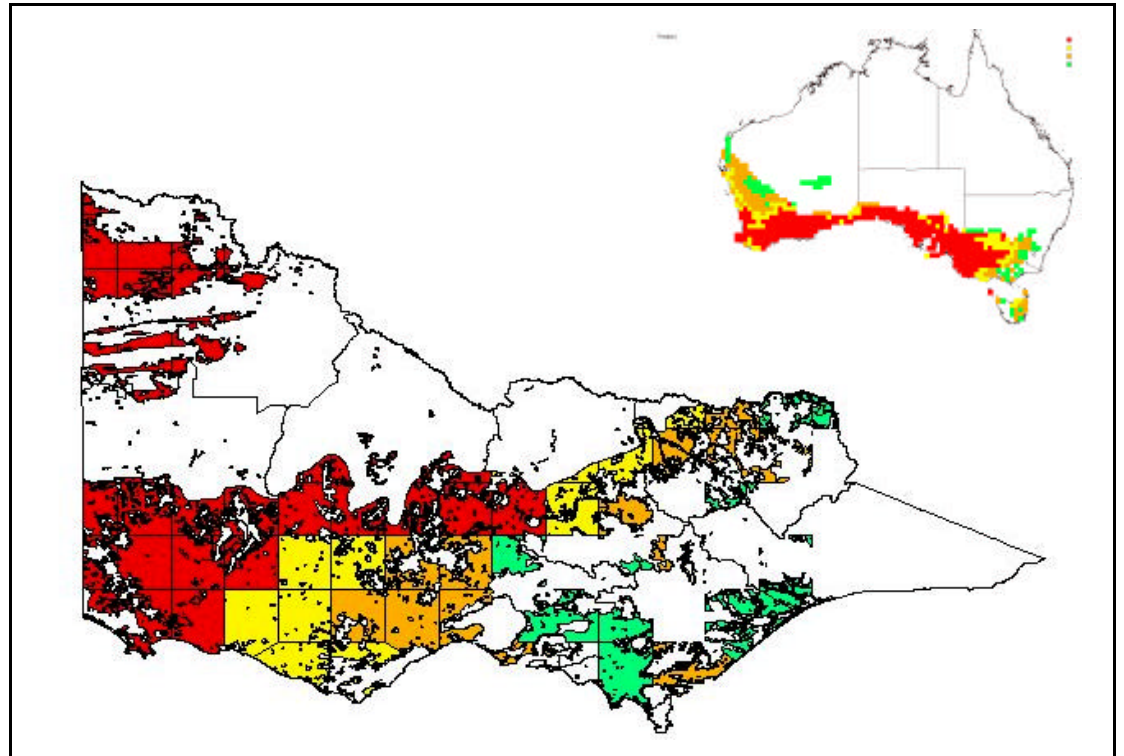
Broad vegetation types

Coastal scrubs and grassland; coastal grassy woodland; inland slopes woodland; montane dry woodland; grassland; plains grassy woodland; herb-rich woodland; rainshadow woodland; mallee; boinka-raak; mallee woodland

Colours indicate possibility of *Retama raetam* infesting these areas.

Red	= Very high	Yellow	= High
Orange	= Medium	Green	= Likely

In the non-coloured areas the plant is unlikely to establish as the climate, soil or landuse is not presently suitable.



Impact Assessment Record

Scientific Name: *Retama raetam* (Forssk.) Webb

Common name: white weeping broom

QUESTION	COMMENTS	RATING	CONFIDENCE
Social			
1. Restrict human access?	"May infest grazing land and prevent access to stock" (CRC Weed Management, 2003), making access by people difficult.	MH	M
2. Reduce tourism?	As an invader of "scrub and woodland on coastal, sandy soils" (Csurhes & Edwards, 1998), this xerophytic plant (see photo in CRC Weed Management, 2003) would not be obvious to the average visitor.	L	M
3. Injurious to people?	Although it is toxic, "the plant is not usually eaten, its bitter taste repels animals...There are no characteristic legions" (El Bahri et al, 1999). The taste is likely to deter people from eating the plant and it doesn't appear to irritate the skin.	L	H
4. Damage to cultural sites?	Although not obvious to the average visitor (see Q. 2), for people more familiar with cultural sites, this 3m high and 6m wide plant (CRC Weed Management, 2003) may have a moderate visual effect.	ML	M
Abiotic			
5. Impact flow?	Terrestrial species known to invade "scrub and woodland on coastal, sandy soils" Csurhes & Edwards, 1998).	L	MH
6. Impact water quality?	Terrestrial species known to invade "scrub and woodland on coastal, sandy soils" Csurhes & Edwards, 1998).	L	MH
7. Increase soil erosion?	This plant has a "shallow and deep root system" and its "cladodes...are effective in capturing and retaining soil." Being "poisonous and unpalatable animals avoid walking or grazing on its cladodes" (El-Bana et al, 2003) would also assist reduces erosion locally. However, since the plant can "form a scrub layer that can outcompete and shade out native plants," if these plants are destroyed by fire (CRC Weed Management, 2003) large areas of bare soil may be exposed, increasing the risk of erosion.	ML	M
8. Reduce biomass?	Where <i>R. raetam</i> shades and outcompetes native vegetation (CRC Weed Management, 2003), direct replacement of biomass is likely to occur.	ML	M
9. Change fire regime?	"It can...increase the severity of bushfire if it dies off in large stands" (CRC Weed Management, 2003).	ML	M
Community Habitat			
10. Impact on composition (a) high value EVC	EVC=Shallow Sands Woodland (E), CMA= Glenelg-Hopkins, Bioreg.=Gippsland Plain, CLIMATE=VH. This 3m tall x 6m wide shrub "form[s] a scrub layer that can outcompete and shade out native plants" and invades scrub and woodlands (CRC Weed Management, 2003). Major displacement of some dominant species within different layers.	MH	M
(b) medium value EVC	EVC=Woorinen Sands Mallee (D), CMA= Mallee, Bioreg.=Murray Mallee, CLIMATE=VH. This 3m tall x 6m wide shrub "form[s] a scrub layer that can outcompete and shade out native plants" and invades scrub and woodlands (CRC Weed Management, 2003). Major displacement of some dominant species within different layers.	MH	M

Impact Assessment Record

Scientific Name: *Retama raetam* (Forssk.) Webb

Common name: white weeping broom

QUESTION	COMMENTS	RATING	CONFIDENCE
(c) low value EVC	EVC=Loamy Sands Mallee (Lc), CMA= Mallee, Bioreg.=Murray Mallee, CLIMATE=VH. This 3m tall x 6m wide shrub “form[s] a scrub layer that can outcompete and shade out native plants” and invades scrub and woodlands (CRC Weed Management, 2003). Major displacement of some dominant species within different layers.	MH	M
11. Impact on structure?	This 3m tall x 6m wide shrub “form[s] a scrub layer that can outcompete and shade out native plants” and invades scrub and woodlands (CRC Weed Management, 2003). It is likely to have a major impact on the ground and understorey and shrub layers, but less of an impact on the tree layer.	MH	M
12. Effect on threatened flora?	No information found.	MH	L
Fauna			
13. Effect on threatened fauna?	No information found.	MH	L
14. Effect on non-threatened fauna?	As an unpalatable shrub (El-bana et al, 2003) that invades and outcompetes native understorey and shrub species, its presence may reduce the food available to fauna.	MH	H
15. Benefits fauna?	As a large shrub, with branches drooping to the ground (see photo in CRC Weed Management, 2003), it may provide some shelter.	MH	M
16. Injurious to fauna?	Toxic and “not usually eaten...Palatable for the dromedary...Dromedaries and goats are the most often affected” (Bahri et al, 1999). It is possible that indigenous fauna, which may be poisoned by it, might eat this plant.	H	H
Pest Animal			
17. Food source to pests?	Toxic and “not usually eaten...Palatable for the dromedary...Dromedaries and goats are the most often affected” (Bahri et al, 1999). May be eaten by feral goats, but as it is toxic (Bahri et al, 1999) it would provide minimal food.	L	H
18. Provides harbor?	As a large shrub, with branches drooping to the ground (see photo in CRC Weed Management, 2003), it may harbour foxes or rabbits as overnight cover.	MH	M
Agriculture			
19. Impact yield?	“It has the potential to become a significant threat to Australia’s pastoral industry.” As an “aggressive invader” that “may infest grazing land and prevent access to stock” (CRC Weed Management, 2003), and being an unpalatable shrub (El-bana et al, 2003), it could reduce the carrying capacity of the land by more than 5%. “All domestic species are susceptible” to intoxication which can kill (Bahri et al, 1999).	MH	MH

Impact Assessment Record

Scientific Name: *Retama raetam* (Forssk.) Webb

Common name: white weeping broom

QUESTION	COMMENTS	RATING	CONFIDENCE
20. Impact quality?	"Its toxins can taint milk, giving it an acrid taste and nasty smell and may poison nursing animals" (El Bahri et al, 1999). This could cause milk products to be rejected for sale.	H	H
21. Affect land value?	Land value is likely to be affected where severe infestations make grazing not viable (see Q. 19).	MH	MH
22. Change land use?	Control is expensive, since any treatments will need to continue for years until the seedbank is depleted (CRC Weed Management, 2003). Since the shrub is unpalatable (El-bana et al, 2003) and toxic (Bahri et al, 1999), land use may have to change from grazing to cropping.	MH	MH
23. Increase harvest costs?	"May infest grazing land and prevent access to stock" and control is expensive, since any treatments will need to continue for years until the seedbank is depleted (CRC Weed Management, 2003). Managing stock on infested lands and the control of infestations could both cause a major increase in harvest costs.	H	M
24. Disease host/vector?	No reference of this plant as a disease host/vector in CRC Weed Management (2003).	L	M

References cited:

- CRC Weed Management 2003, *Weed Management Guide- White weeping broom - Retama raetam*, CRC Weed Management, Australia.
- Csurhes S & Edwards R 1998, *Potential Environmental Weeds in Australia, Candidate Species for Preventative Control*, Biodiversity Group, Environment Australia, Canberra, ACT.
- El-Bana M, Jijis I & Khedr AA 2003, 'The importance of Phytogenic Mounds (Nebkhas) for Restoration of Arid Degraded Rangelands in Northern Sinai,' *Restoration Ecology*, vol. 11(3), p. 317-324.
- El Bahri L, Djegham M & Bellil H 1999, 'Retama raetam W: A poisonous plant of North Africa,' *Veterinary & Human Toxicology* Vol. 41(1), p. 33-35.
- d'Arces PJ 1961, 'A contribution to the study of sheep-feeding in Algeria,' *C. R. Acad. Agric. Fr.*, vol 47(12). P. 630-7.
- Johnson MB 2005, *Desert Legume Program*, University of Arizona College of Agriculture and Life Sciences, and the Boyce Thompson Southwestern Arboretum, Arizona, viewed: 29/12/2005, <http://cals.arizona.edu/desertlegumeprogram/pdf/Survival.pdf>.
- Liang W & Steinberger Y 2001, 'Temporal changes in nematode community structure in a desert ecosystem,' *Journal of Arid Environments*, Vol. 48(3), p. 267-280.
- Pnueli L, Hallak-Herr E, Rozenberg M, Cohen M, Goloubinoff P, Kaplan A & Mittler R 2002, 'Molecular and biochemical mechanisms associated with dormancy and drought tolerance in the desert legume *Retama raetam*,' *The Plant Journal* Vol. 31(3), p. 319-330.
- Whitinger D 2006 *Detailed information on White Weeping Broom, Portuguese Broom (Retama raetam)*, Dave's Garden, Bryan/College Station, Texas, USA, viewed: 02/01/2006, <http://davesgarden.com/pf/go/72774/index.html>.

Revisions

Date Revised by Revision

Invasiveness Assessment Record

Scientific name: *Rubus alceifolius* Poir.

Common Name: giant bramble

QUESTION	COMMENTS	RATING	CONFIDENCE
Establishment			
1. Germination requirements?	“Seeds germinate at any time of the year providing moisture is available but mainly in December – January” (Parsons & Cuthbertson, 1992).	H	MH
2. Establishment requirements?	“Sunny slopes, mixed forest in valleys, boggy thickets, roadsides, rock crevices” (Lingdi & Boufford, 2003). “Seeds germinated along forest paths and in clearings...Seed germination [occurred] in an opening in the forest canopy” (Baret et al., 2003). This suggests the need for some direct light.	ML	H
3. How much disturbance is required?	Developing or run-down pastures, wet gullies, creekbanks, perimeter of rainforest areas, along roadsides (Parsons & Cuthbertson, 1992). Disturbed rainforest and logging tracks (DNRM, 2005). Establishes in highly disturbed natural ecosystems.	ML	MH
Growth/Competitive			
4. Life form?	Scandent shrub to 5m with arching or climbing branches (Lingdi & Boufford, 2003) that can reach to the top of the canopy in forest (Baret et. al, 2003).	ML	H
5. Allelopathic properties?	None recorded in Parsons & Cuthbertson (1992).	L	M
6. Tolerates herb pressure?	No information found.	M	L
7. Normal growth rate?	Vigorous (Parsons & Cuthbertson, 1992).	H	MH
8. Stress tolerance to frost, drought, w/logg, sal. etc?	Grows in boggy thickets (Lingdi & Boufford, 2003). “Proliferates on the...coasts...from sea level” (Baret et. al, 2003). Tolerates waterlogging and salinity. The types of vegetation in which this plant grows eg. Rainforest (Bean, 1997) and other humid, wet habitats (Parsons & Cuthbertson, 1992), suggests that this plant does not tolerate drought and probably does not tolerate frost either.	ML	MH
Reproduction			
9. Reproductive system	Vegetative (Baret et. al, 2003) and seed (Baret et. al, 2004).	H	H
10. Number of propagules produced?	More than 10 000 seeds per sq metre were found under patches of <i>R. alceifolius</i> (Baret, Bourgeois & Strasberg, 2005). Fruit production averaged between 30 and 80 fruits/m ² (Baret et. al, 2004). “Each flower possesses ~100 separate styles and stigmas” (Amsellem, Noyer & Hossaert-McKey, 2001) so you could predict that over a m ² , this plant could produce 100 x 80 = 8000 seeds.	H	H
11. Propagule longevity?	“A small proportion of these seeds remained viable in the soil for many years” (Baret, Le Bourgeois & Strasberg, 2005), suggesting that they probably survive for more than 5 years.	M	L
12. Reproductive period?	No information found	M	L
13. Time to reproductive maturity?	Flowers produced in second year of the plant’s growth (Parsons & Cuthbertson, 1992).	MH	MH

Invasiveness Assessment Record

Scientific name: *Rubus alceifolius* Poir.

Common Name: giant bramble

QUESTION	COMMENTS	RATING	CONFIDENCE
Dispersal			
14. Number of mechanisms?	Seed. "Capacity to form roots...with or without soil contact" (Baret et. al, 2003).	H	H
15. How far do they disperse?	"Spread occurs when the succulent fruit is eaten by birds and animals, and seeds are voided in their droppings" (Parsons & Cuthbertson, 1992) so some seeds are very likely to disperse more than 1km.	H	MH

References cited:

- Amsellem L, Noyer J & Hossaert-McKey 2001, 'Evidence of a switch in the reproductive biology of *Rubus alceifolius* (Rosaceae) towards apomixis, between its native range and its area of introduction,' *American Journal of Botany*, Vol.88(12), pp. 2243-2251.
- Baret, S, Le Bourgeois, T & Strasberg, D 2005, 'Comment *Rubus alceifolius*, une espece exotique envahissante, pourrait-elle progressivement coloniser la totalite d'une foret tropicale humide ?' *Canadian Journal of Botany*, vol 83(2), p. 219.
- Baret, S, Maurice S, Le Bourgeois T, & Strasberg d 2004, 'Altitudinal variation in fertility and vegetative growth in the invasive plant *Rubus alceifolius*Poiret (Roaceae, on Reunion island.' *Plant Ecology*, vol. 172(2), p. 265-273.
- Baret, S, Nicoline, E, Le Bourgeois, T & Strasberg, D 2003, 'Developmental Patterns of the Invasive Bramble (*Rubus alceifolius* Poiret, Rosaceae) in Réunion Island: an Architectural and Morphometric Analysis,' *Annals of Botany*, vol. 91, pp. 39-48
- Bean, AR 1997, 'A revision of *Rubus* subg. *Malachobatus* (Focke) Focke and *Rubus* subg. *Diemenicus* A.R. Bean (Rosaceae) in Australia,' *Austrobaileya* vol. 5(1), p. 39-51.
- Department of Natural Resources and Mines (DNRM) 2005, *Facts pest series Giant bramble Rubus alceifolius PP24*, Land Protection, Queensland, Australia.
- Lingdi, L & Boufford, D E 2003, '28. *Rubus*,' *Flora of China*, vol. 9, pp. 195-285.
- Parsons WT & Cuthbertson EG 1992, *Noxious Weeds of Australia*, Inkata Press, Melbourne and Sydney.

Revisions

Date Revised by Revision

Present distribution of *Rubus alceifolius* in Victoria

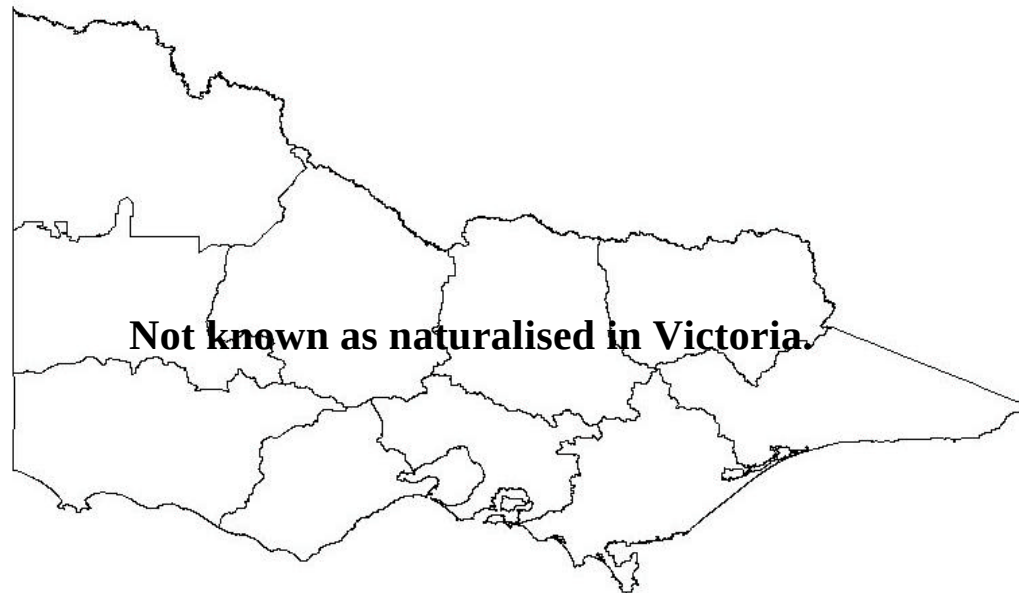
Scientific name: *Rubus alceifolius* Poir

Common name(s): giant bramble

Status:

Habitat:

Wet gullies, creekbanks and the perimeter of rainforests in the humid tropics, occurring as a weed along roadsides and in newly sown or run-down pastures (Parsons & Cuthbertson 2001). On Réunion Island, found in lowland rainforest, mountain and submountain rainforest from sea level to 1700 m (Baret *et al* 2004). Sunny slopes, mixed forests in valleys, boggy thickets, roadsides, rock crevices, 500-2000 m. (Zheng-yi & Raven eds 2003).



Potential distribution of *Rubus alceifolius* in Victoria

Scientific name: *Rubus alceifolius* Poir

Common name(s): giant bramble

Status:

Habitat:

Wet gullies, creekbanks and the perimeter of rainforests in the humid tropics, occurring as a weed along roadsides and in newly sown or run-down pastures (Parsons & Cuthbertson 2001). On Réunion Island, found in lowland rainforest, mountain and submountain rainforest from sea level to 1700 m (Baret *et al* 2004). Sunny slopes, mixed forests in valleys, boggy thickets, roadsides, rock crevices, 500-2000 m. (Zheng-yi & Raven eds 2003).

Potential distribution produced from CLIMATE modelling refined by applying suitable landuse and vegetation type overlays with CMA boundaries

MAP OVERLAYS USED.

Land Use:

Pasture irrigation

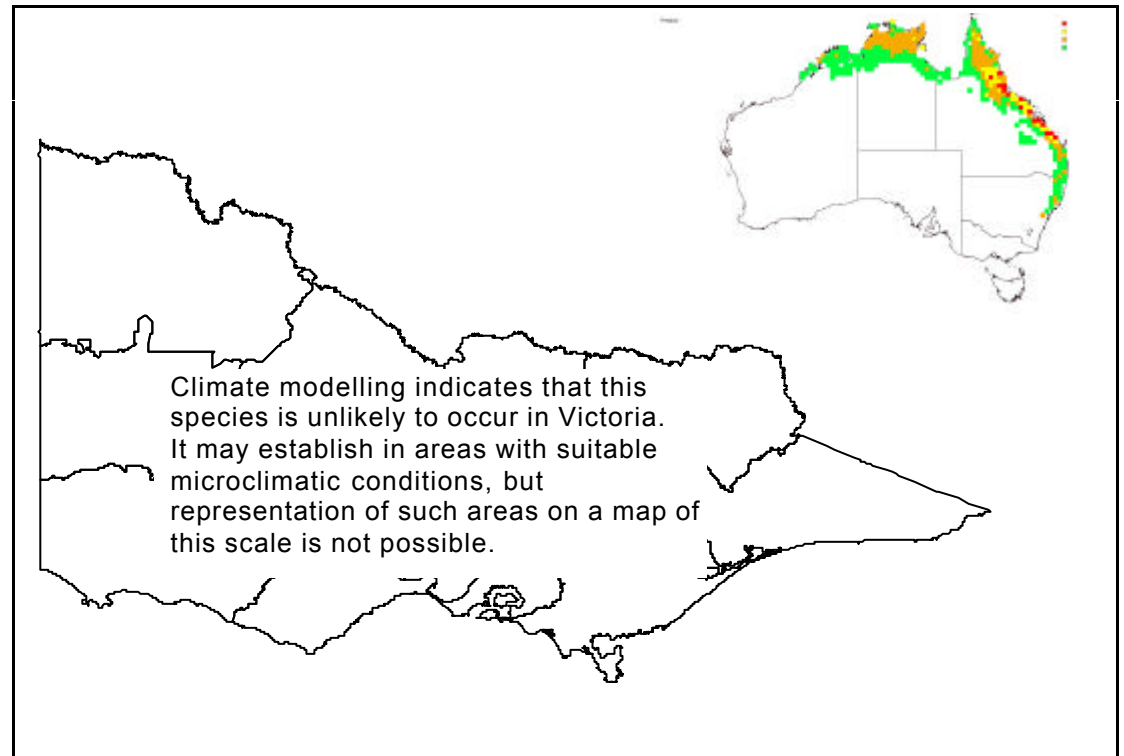
Broad vegetation types

Lowland forest; swamp scrub; moist foothill forest; montane moist forest; riparian forest.

Colours indicate possibility of *Rubus alceifolius* infesting these areas.

Red	= Very high	Yellow	= High
Orange	= Medium	Green	= Likely

In the non-coloured areas the plant is unlikely to establish as the climate, soil or landuse is not presently suitable.



Impact Assessment Record

Scientific Name: *Rubus alceifolius* Poir.

Common name: giant bramble

QUESTION	COMMENTS	RATING	CONFIDENCE
Social			
1. Restrict human access?	“Forms impenetrable thickets” (Parsons & Cuthbertson, 1992). “Will encroach onto roadways” (DNRM, 2005). “Seeds germinated along forest paths” (Baret et al., 2003) and creekbanks (Parsons & Cuthbertson, 1992). People and/or vehicles access with difficulty.	MH	M
2. Reduce tourism?	Where this plant invades creekbanks and forms impenetrable thickets (Parsons & Cuthbertson, 1992), access to waterways for recreational use will be affected.	MH	MH
3. Injurious to people?	“Sparse, recurved prickles to 5mm” (Lingdi & Boufford, 2003) all year.	MH	H
4. Damage to cultural sites?	Scandent shrub to 5m with arching or climbing branches (Lingdi & Boufford, 2003) that can reach to the top of the canopy in forest (Baret et. al, 2003) and that forms impenetrable thickets (Parsons & Cuthbertson, 1992) will have a moderate visual effect at cultural sites.	ML	H
Abiotic			
5. Impact flow?	Invades creekbanks (Parsons & Cuthbertson, 1992). Terrestrial species.	L	MH
6. Impact water quality?	Invades creekbanks (Parsons & Cuthbertson, 1992). Terrestrial species.	L	MH
7. Increase soil erosion?	The permanent root system formed by thickets of this plant (Parsons & Cuthbertson, 1992) is likely to decrease the risk of erosion.	L	MH
8. Reduce biomass?	As this plant forms dense thickets, where it invades rainforest (Parsons & Cuthbertson, 1992), it is likely to directly replace biomass but where it invades pasture and roadsides (Parsons & Cuthbertson, 1992) it will increase biomass.	L	MH
9. Change fire regime?	This species grows in rainforest in its natural range (Bean, 1997) and invades rainforest in Australia (Parsons & Cuthbertson), so is unlikely to change fire regime much.	L	MH
Community Habitat			
10. Impact on composition (a) high value EVC	Climate modelling shows that this species is not likely to occur as an invasive plant in Victoria.	L	H
(b) medium value EVC	Climate modelling shows that this species is not likely to occur as an invasive plant in Victoria.	L	H
(c) low value EVC	Climate modelling shows that this species is not likely to occur as an invasive plant in Victoria.	L	H
11. Impact on structure?	Scandent shrub to 5m with arching or climbing branches (Lingdi & Boufford, 2003) that can reach to the top of the canopy in forest (Baret et. al, 2003) and cover other plants (NAPPO, 2006). Invading “disturbed rainforest areas, wet gullies, creekbanks, perimeter of rainforest areas” (Parsons & Cuthbertson, 1992). Likely to have a major effect on the shrub and groundcover layers and a minor effect on the tree layer.	MH	MH

Impact Assessment Record

Scientific Name: *Rubus alceifolius* Poir.

Common name: giant bramble

QUESTION	COMMENTS	RATING	CONFIDENCE
12. Effect on threatened flora?	Climate modelling shows that this species is not likely to occur as an invasive plant in Victoria.	L	H
Fauna			
13. Effect on threatened fauna?	Climate modelling shows that this species is not likely to occur as an invasive plant in Victoria.	L	H
14. Effect on non-threatened fauna?	Scandent shrub to 5m with arching or climbing branches (Lingdi & Boufford, 2003) that can reach to the top of the canopy in forest (Baret et. al, 2003) and cover other plants (NAPPO, 2006). Invading “disturbed rainforest areas, wet gullies, creekbanks, perimeter of rainforest areas” (Parsons & Cuthbertson, 1992). Likely to have a major effect on the shrub and groundcover layers and a minor effect on the tree layer. This may reduce the food and habitat available to fauna species, reducing their numbers.	MH	H
15. Benefits fauna?	Berries are eaten by birds and animals (Parsons & Cuthbertson, 1992).	MH	MH
16. Injurious to fauna?	“Sparse, recurved prickles to 5mm” (Lingdi & Boufford, 2003) all year.	MH	H
Pest Animal			
17. Food source to pests?	Berries are eaten by birds and animals (Parsons & Cuthbertson, 1992).	ML	MH
18. Provides harbor?	Dense thickets (Parsons & Cuthbertson, 1992) are likely to provide permanent harbour to foxes and rabbits.	H	MH
Agriculture			
19. Impact yield?	“Occurring as a weed...in newly sown or run-down pastures...Forms impenetrable thickets which reduce pasture productivity and may limit access to water.” (Parsons & Cuthbertson, 1992). Large infestations may reduce the carrying capacity of land by more than 5%.	MH	MH
20. Impact quality?	No impact on quality recorded in Parsons & Cuthbertson (1992).	L	MH
21. Affect land value?	As this plant can be controlled by cultivation (Parsons & Cuthbertson, 1992), it is unlikely to affect land value.	L	MH
22. Change land use?	Following control by cultivation (Parsons & Cuthbertson, 1992) land can continue to be used for grazing.	L	MH
23. Increase harvest costs?	Cultivation to control this plant involves the use of bulldozing, ploughing and ripping, the sowing of an annual crop, followed by more cultivation and the establishment of pasture (Parsons & Cuthbertson, 1992). This two year process involving the use of expensive equipment for several days would cause a major increase in labour and machinery costs.	H	MH
24. Disease host/vector?	Not recorded as a disease host/vector in Parsons & Cuthbertson (1992).	L	MH

Impact Assessment Record

Scientific Name: *Rubus alceifolius* Poir.

Common name: giant bramble

References cited:

- Amsellem L, Noyer J & Hossaert-McKey 2001, 'Evidence of a switch in the reproductive biology of *Rubus alceifolius* (Rosaceae) towards apomixis, between its native range and its area of introduction,' *American Journal of Botany*, Vol.88(12), pp. 2243-2251.
- Baret, S, Le Bourgeois, T & Strasberg, D 2005, 'Comment *Rubus alceifolius*, une espece exotique envahissante, pourrait-elle progressivement coloniser la totalite d'une foret tropicale humide ?' *Canadian Journal of Botany*, vol 83(2), p. 219.
- Baret, S, Maurice S, Le Bourgeois T, & Strasberg d 2004, 'Altitudinal variation in fertility and vegetative growth in the invasive plant *Rubus alceifolius*Poiret (Roaceae, on Reunion island.' *Plant Ecology*, vol. 172(2), p. 265-273.
- Baret, S, Nicoline, E, Le Bourgeois, T & Strasberg, D 2003, 'Developmental Patterns of the Invasive Bramble (*Rubus alceifolius* Poiret, Rosaceae) in Réunion Island: an Architectural and Morphometric Analysis,' *Annals of Botany*, vol. 91, pp. 39-48
- Bean, AR 1997, 'A revision of *Rubus* subg. *Malachobatus* (Focke) Focke and *Rubus* subg. *Diemenicus* A.R. Bean (Rosaceae) in Australia,' *Austrobaileya* vol. 5(1), p. 39-51.
- Department of Natural Resources and Mines (DNRM) 2005, *Facts pest series Giant bramble Rubus alceifolius PP24*, Land Protection, Queensland, Australia.
- Lingdi, L & Boufford, D E 2003, '28. *Rubus*,' *Flora of China*, vol. 9, pp. 195-285.
- North american Plant Porotection Organisation (NAPPO) 2006 'Phytosanitary Alert System,' NSF Centre for Integrated Pest Managemnt, viewed: 13/01/2006
www.pestalert.org/viewArchPestAlert_print.cfm?rid=74.
- Parsons WT & Cuthbertson EG 1992, *Noxiouis Weeds of Australia*, Inkata Press, Melbourne and Sydney.

Revisions

Date	Revised by	Revision

Invasiveness Assessment Record

Scientific name: *Rubus argutus* Link

Common Name: Florida blackberry

QUESTION	COMMENTS	RATING	CONFIDENCE
Establishment			
1. Germination requirements?	“Seedling establishment appears to be enhanced by soil disturbance” (Tunison, 1985). Requires cold stratification for seed germination (NPDC, 2006). Requires natural seasonal low temperatures to germinate.	MH	MH
2. Establishment requirements?	Moderately shade tolerant...[as] under a sparse canopy. It can be shaded out or severely suppressed by deep shade” (Tunison, 1985).	MH	MH
3. How much disturbance is required?	“Able to invade and take over native ecosystems without any apparent disturbance” (Smith, 1985).	H	MH
Growth/Competitive			
4. Life form?	Shrub (NPDC, 2006).	L	MH
5. Allelopathic properties?	Not noted in Smith (1985), “none” (NPDC, 2006).	L	MH
6. Tolerates herb pressure?	Low hedging tolerance by livestock or wildlife with medium palatability (NPDC, 2006).	ML	MH
7. Normal growth rate?	Rapid (NPDC, 2006).	H	MH
8. Stress tolerance to frost, drought, w/logg, sal. Fire etc?	“Occurs in wet to mesic habitats...Resprouts quickly following fire (Smith, 1985). Recorded in boggy sites (Tunison, 1991). Tolerates temperatures as low as –25°C (NPDC, 2006). Medium drought tolerance. Not tolerant to salinity (NPDC, 2006). Highly resistant to frost, fire and waterlogging, some drought tolerance but susceptible to salinity.	H	MH
Reproduction			
9. Reproductive system	Seed and vegetatively (NPDC, 2006) by root sprouting and aerial shoots forming roots with soil contact (Smith, 1985).	H	MH
10. Number of propagules produced?	High fruit/seed abundance (NPDC), 2006).	H	MH
11. Propagule longevity?	Unknown	M	L
12. Reproductive period?	Lifespan is moderate (rather than long or short) relative to most other plants (NPDC, 2006) and forms dense clonal thickets (monocultures) (Tunison, 1991).	H	MH
13. Time to reproductive maturity?	Floricanes develop in the second year (Tunison, 1991).	MH	MH
Dispersal			
14. Number of mechanisms?	Frugivorous birds (Smith, 1985).	H	MH

Invasiveness Assessment Record

Scientific name: *Rubus argutus* Link

Common Name: Florida blackberry

QUESTION	COMMENTS	RATING	CONFIDENCE
15. How far do they disperse?	Bird dispersal (Smith, 1985) makes it very likely that some propagules will disperse greater than 1km.	H	MH

References cited:

National Plant Data Centre (NPDC) 2006, Plants Database, United States Department of Agriculture, Washington DC, USA, viewed: 30/01/2006,
http://plants.nrcs.usda.gov/cgi_bin/topics.cgi?earl=plant_attribute.cgi&symbol=RUAR2.

Smith CW 1985, 'Impact of alien plants on Hawai'i's native biota,' pp. 180-250 In Stone CP & Scott JM (eds.) *Hawai'i's Terrestrial Ecosystems: preservation and Management*, University of Hawaii Coop. Natural Resources Studies Unit.

Tunison T 1991, *Element stewardship abstract for Rubus argutus*, the Nature Conservancy, Virginia, USA.

Revisions

Date	Revised by	Revision

Present distribution of *Rubus argutus* in Victoria

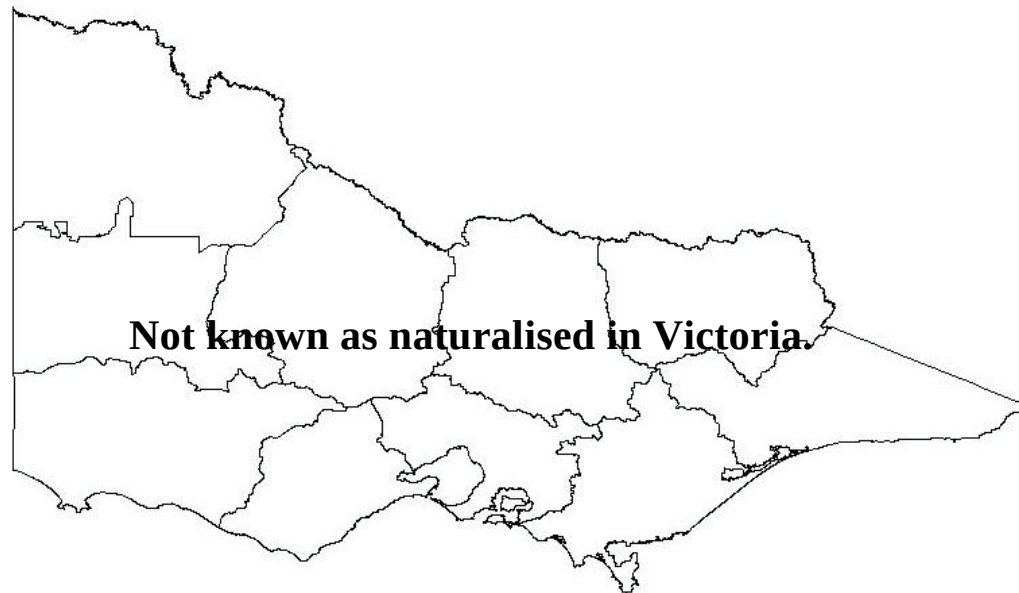
Scientific name: *Rubus argutus* Link

Common name(s): Florida blackberry, sawtooth blackberry

Status:

Habitat:

Requires moist soil. Grows in dry or moist thickets and woodland margins. In Hawaii, best developed from 1000 – 2000 m elevation in mesic to moderately wet, relatively open and disturbed habitats. (NPDC 2006) Grows in disturbed habitats, including mesic to wet forest and subalpine grassland. (GISI 2005)



Potential distribution of *Rubus argutus* in Victoria

Scientific name: *Rubus argutus* Link

Common name(s): Florida blackberry, sawtooth blackberry

Status:

Habitat:

Requires moist soil. Grows in dry or moist thickets and woodland margins. In Hawaii, best developed from 1000 – 2000 m elevation in mesic to moderately wet, relatively open and disturbed habitats. (NPDC 2006) Grows in disturbed habitats, including mesic to wet forest and subalpine grassland. (GISI 2005)

Potential distribution produced from CLIMATE modelling refined by applying suitable landuse and vegetation type overlays with CMA boundaries

MAP OVERLAYS USED.

Land Use:

Forest private plantation
Forest public plantation

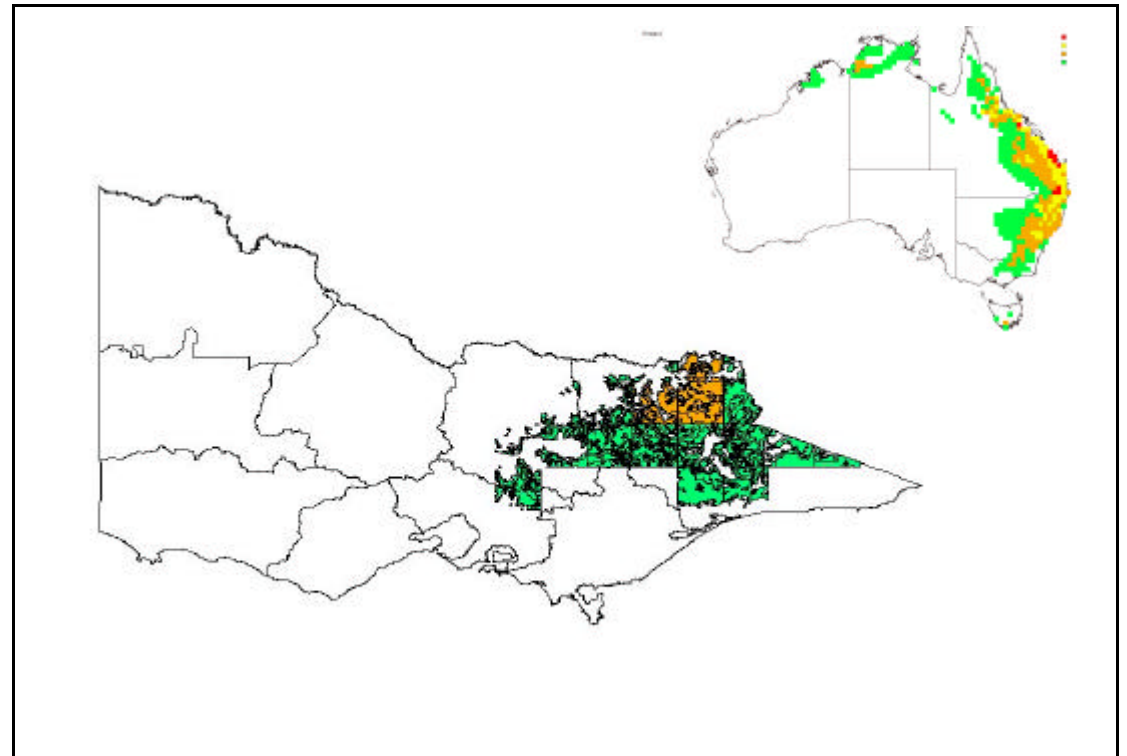
Broad vegetation types

Inland slopes woodland; dry foothill forest; moist foothill forest; montane dry woodland; montane moist forest; sub-alpine woodland; sub-alpine grassy woodland; montane grassy woodland; riverine grassy woodland; riparian forest.

Colours indicate possibility of *Rubus argutus* infesting these areas.

Red	= Very high	Yellow	= High
Orange	= Medium	Green	= Likely

In the non-coloured areas the plant is unlikely to establish as the climate, soil or landuse is not presently suitable.



Impact Assessment Record

Scientific Name: *Rubus argutus* Link

Common name: Florida blackberry

QUESTION	COMMENTS	RATING	CONFIDENCE
Social			
1. Restrict human access?	Prickly shrub to 2.5m tall (NPDC, 2006) that forms impenetrable thickets (Smith, 1985), see also photo from ISI (2005), a major impediment to human access.	H	MH
2. Reduce tourism?	The ability of this tall, prickly shrub (NPDC, 2006) to grow in boggy soil (Tunison, 1991) and form impenetrable thickets (Smith, 1985) may have a major impact on recreation around waterways, restricting access and being obvious to most visitors.	H	MH
3. Injurious to people?	Prickles up to 8mm long on stems (always present) and also prickles on leaf margins most of the year (deciduous) (Tunison, 1991).	MH	MH
4. Damage to cultural sites?	Moderate visual effect caused by large, prickly shrub (NPDC, 1991).	ML	MH
Abiotic			
5. Impact flow?	Able to grow in boggy soil (Tunison, 1991) but not recorded in permanent water. Terrestrial species.	L	MH
6. Impact water quality?	Able to grow in boggy soil (Tunison, 1991) but not recorded in permanent water. Terrestrial species.	L	MH
7. Increase soil erosion?	Forms thickets (Smith, 1985) and able to grow in boggy soil (Tunison, 1991) which may enable it to bind soil otherwise prone to soil erosion.	L	MH
8. Reduce biomass?	"Habitat-disruptive when dense clonal thickets form...Most other native plants are excluded from these thickets when fully developed" (Tunison, 1991). Where this plant replaces taller species it will reduce biomass slightly.	MH	MH
9. Change fire regime?	"Habitat-disruptive when dense clonal thickets form...Most other native plants are excluded from these thickets when fully developed" (Tunison, 1991). Although this plant does burn (Smith, 1985) it does not provide a dried fuel source like the grasses that it replaces so it would cause a minor decrease in fire intensity.	ML	MH
Community Habitat			
10. Impact on composition (a) high value EVC	EVC= Montane riparian woodland (V); CMA=North East; Bioreg=Highlands-Northern Fall; CLIMATE potential=M. Displaces all species within the ground and/or shrub layers.	H	MH
(b) medium value EVC	EVC= Montane grassy woodland (D); CMA=North East; Bioreg=Highlands-Northern Fall; CLIMATE potential=M. "Smother[s] vegetation, displacing the native species or preventing their reestablishment" (Smith, 1985). Grows to 2.5m tall (NPDC, 2006). Displaces all species within the ground and/or shrub layers.	H	MH
(c) low value EVC	EVC= Riparian forest (LC); CMA=North East; Bioreg=Highlands-Northern Fall; CLIMATE potential=M. "Smother[s] vegetation, displacing the native species or preventing their reestablishment" (Smith, 1985). Grows to 2.5m tall (NPDC, 2006). Displaces all species within the ground and/or shrub layers.	H	MH

Impact Assessment Record

Scientific Name: *Rubus argutus* Link

Common name: Florida blackberry

QUESTION	COMMENTS	RATING	CONFIDENCE
11. Impact on structure?	“Habitat-disruptive when dense clonal thickets form...Most other native plants are excluded from these thickets when fully developed, although some [vigorous, shade-tolerant species] tolerate or even penetrate a blackberry canopy...Forms large thickets in upper elevation forests” (Tunison, 1991). “Smother[s] vegetation, displacing the native species or preventing their reestablishment” (Smith, 1985). Grows to 2.5m tall (NPDC, 2006). Able to have a major effect on the ground and shrub layers, displacing most or all of the species, but unlikely to outcompete the trees.	MH	MH
12. Effect on threatened flora?	No information found.	MH	L
Fauna			
13. Effect on threatened fauna?	No information found.	MH	L
14. Effect on non-threatened fauna?	One of 12 of the most significant environmental weeds on the Hawaiian Islands...serious threat to native ecosystems (Smith, 1985). “Smother[s] vegetation, displacing the native species or preventing their reestablishment” (Smith, 1985). Large infestations could reduce habitat and food sources for native fauna, leading to a local reduction in numbers.	MH	MH
15. Benefits fauna?	Palatable to grazing animals (Caldwell et. al, 2001). May provide an alternative food source for grazing animals and some bird species that might eat the berries (Parsons & Cuthbertson, 1992) and shelter for small vertebrates due to its thorny nature (Tunison, 1991).	MH	MH
16. Injurious to fauna?	Prickles up to 8mm long on stems (always present) and also prickles on leaf margins most of the year (deciduous) (Tunison, 1991). Sheep can become entangled in the canes of the related and similar <i>R. fruticosus</i> (Parsons & Cuthbertson, 1992). Dangerous to fauna.	H	MH
Pest Animal			
17. Food source to pests?	Birds and foxes eat the fruit of the related <i>R. fruticosus</i> (Parsons & Cuthbertson, 1992). Provides	MH	MH
18. Provides harbor?	The related, and similar <i>R. fruticosus</i> harbors foxes and rabbits (Parsons & Cuthbertson, 1992), although Florida blackberry is deciduous (Tunison, 1991) so wouldn't provide harbour for the whole year.	MH	MH
Agriculture			
19. Impact yield?	Grows in plantations (Tunison, 1991), but no evidence found of this plant as an agricultural weed (in Smith, 1985 or Tunison, 1991), probably because they are palatable to grazing animals (Caldwell et. al, 2001). Unlikely to impact yeild.	L	H
20. Impact quality?	See Q 19. Not a weed of agriculture.	L	H
21. Affect land value?	See Q 19. Not a weed of agriculture.	L	H
22. Change land use?	See Q 19. Not a weed of agriculture.	L	H

Impact Assessment Record

Scientific Name: *Rubus argutus* Link

Common name: Florida blackberry

QUESTION	COMMENTS	RATING	CONFIDENCE
23. Increase harvest costs?	See Q 19. Not a weed of agriculture.	L	H
24. Disease host/vector?	Not noted as a disease host/vector (in Smith, 1985 or Tunison, 1991).	L	MH

References cited:

Caldwell H, Bradford L, Leigh C, Pirdle J & Davis M 2001, 'The effects of herbivory on mechanical defense in blackberries, *Rubus argutus*,' Georgia Journal of Science, vol. 59(1).

Global Invasive Species Initiative (ISI) 2005, Nature Conservancy, Arlington, VA, USA, <http://tncweeds.ucdavis.edu/photos/rubar01.jpg>.

National Plant Data Centre (NPDC) 2006, Plants Database, United States Department of Agriculture, Washington DC, USA, viewed: 30/01/2006, http://plants.nrcs.usda.gov/cgi_bin/topics.cgi?earl=plant_attribute.cgi&symbol=RUAR2.

Parsons WT & Cuthbertson EG 1992, *Noxious Weeds of Australia*, Inkata Press, Melbourne and Sydney.

Smith CW 1985, 'Impact of alien plants on Hawai'i's native biota,' pp. 180-250 In Stone CP & Scott JM (eds.) *Hawai'i's Terrestrial Ecosystems: preservation and Management*, University of Hawaii Coop. Natural Resources Studies Unit.

Tunison T 1991, *Element stewardship abstract for Rubus argutus*, the Nature Conservancy, Virginia, USA.

Revisions

Date	Revised by	Revision

Invasiveness Assessment Record

Scientific name: *Rubus rugosus*

Common Name: keriberry

QUESTION	COMMENTS	RATING	CONFIDENCE
Establishment			
1. Germination requirements?	No information found	M	L
2. Establishment requirements?	“Found under slight shade” (Dassanayake & Fosberg, 1980)	MH	H
3. How much disturbance is required?	In its native range, “found under slight shade, in bushy thickets, along edges of jungles or in dense mossy forests” (Dassanayake & Fosberg 1980). “Serious creekline weed...Found in creeks in the Perth area” (Hussey et. al, 1997). Beyond its native range it establishes in highly disturbed natural ecosystems.	ML	H
Growth/Competitive			
4. Life form?	Semiscandent [scrambling] shrub (Dassanayake & Fosberg, 1980).	L	H
5. Allelopathic properties?	No information found	M	L
6. Tolerates herb pressure?	No information found	M	L
7. Normal growth rate?	Strongly growing (Dassanayake & Fosberg, 1980). Very vigorous to 3m (anon., 2005).	H	H
8. Stress tolerance to frost, drought, w/logg, sal. etc?	“”Keep soil moist especially when young...Sandy to clay loam as long as drainage adequate...Avoid areas with heavy or frequent frosts” (anon., 2005). Moderate frost tolerance, intolerant of drought and waterlogging.	L	ML
Reproduction			
9. Reproductive system	“Seeds... Stems sprawl and root where they touch the ground” (Hussey et. al, 1997).	H	MH
10. Number of propagules produced?	Heavy fruiting (anon., 2005). Not enough data.	M	L
11. Propagule longevity?	No information found	M	L
12. Reproductive period?	No information found	M	L
13. Time to reproductive maturity?	“Healthy plants produce fruit after 18 months” (anon., 2005).	ML	ML
Dispersal			
14. Number of mechanisms?	“New plants are spread from seeds carried by birds and foxes” (Hussey et. al, 1997).	H	MH

Invasiveness Assessment Record

Scientific name: *Rubus rugosus*

Common Name: keriberry

QUESTION	COMMENTS	RATING	CONFIDENCE
15. How far do they disperse?	As the seeds are carried by birds and foxes (Hussey et. al, 1997) it is likely that some propagules will disperse greater than 1km.	H	MH

References cited:

Anon 2005, *Daleys Fruit Tree Nursery*, Kyogle, NSW, viewed: 31/01/2006, www.daleysfruit.com.au/plant/Keriberry.htm

Dassanayake, MD & Fosberg, FR (Eds.) 1980, *A revised handbook to the flora of Ceylon*, 2nd ed., Amerind Publishing Co., New Delhi; Springfield, Va.

Hussey BMJ, Keighery GJ, Cousens RD, Dodd J & Lloyd SG 1997, *Western Weeds*, Plant Protection Society of Western Australia, WA.

Revisions

Date	Revised by	Revision

Present distribution of *Rubus rugosus* in Victoria

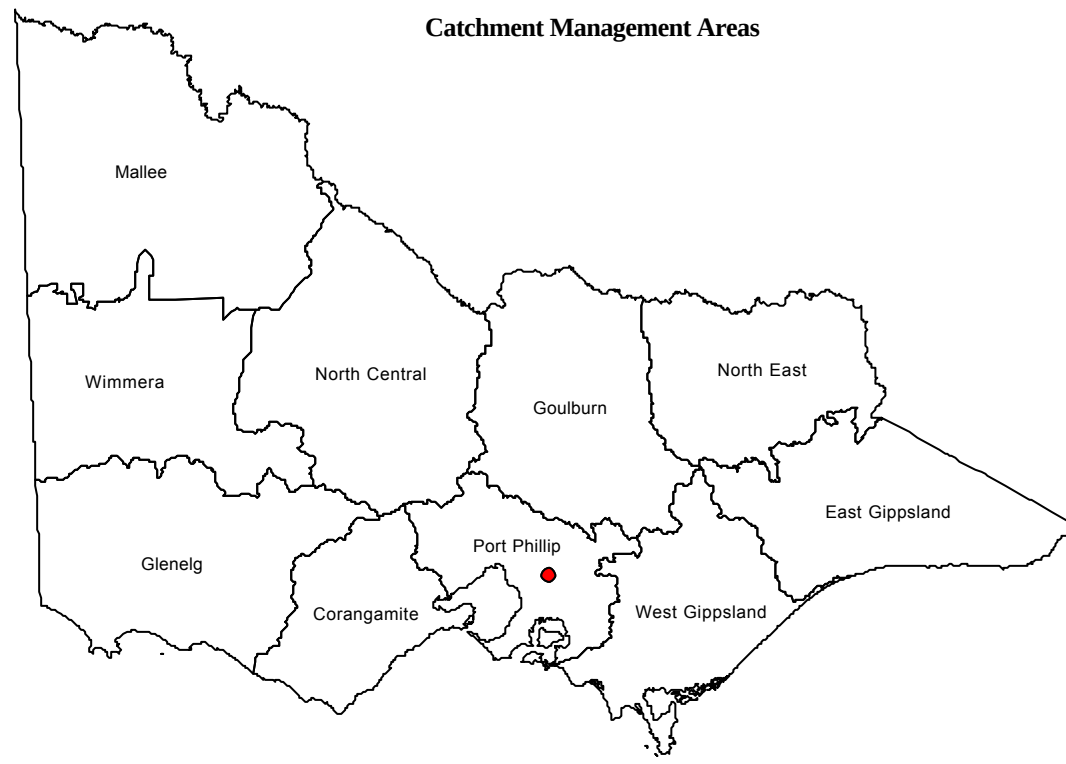
Scientific name: *Rubus rugosus* Sm.

Common name(s): keriberry

Status:

Habitat:

Recorded in Thailand, Nepal, India, Sri Lanka, Burma, Laos, Vietnam, Cambodia, Malay Peninsula on forest margins between 700 – 1300 metres (eds Smitinand & Larsen). Occasional in semi-evergreen forests (Saldanha 1985). Found under slight shade, in bushy thickets, along edges of jungles or in dense mossy forests. In Sri Lanka, confined to upper montane zone above 2000 m alt. (Dassanayake & Fosberg eds 1980)



Potential distribution of *Rubus rugosus* in Victoria

Scientific name: *Rubus rugosus* Sm.

Common name(s): keriberry

Status:

Habitat:

Recorded in Thailand, Nepal, India, Sri Lanka, Burma, Laos, Vietnam, Cambodia, Malay Peninsula on forest margins between 700 – 1300 metres (eds Smitinand & Larsen). Occasional in semi-evergreen forests (Saldanha 1985). Found under slight shade, in bushy thickets, along edges of jungles or in dense mossy forests. In Sri Lanka, confined to upper montane zone above 2000 m alt. (Dassanayake & Fosberg eds 1980)

Potential distribution produced from CLIMATE modelling refined by applying suitable landuse and vegetation type overlays with CMA boundaries

MAP OVERLAYS USED.

Land Use:

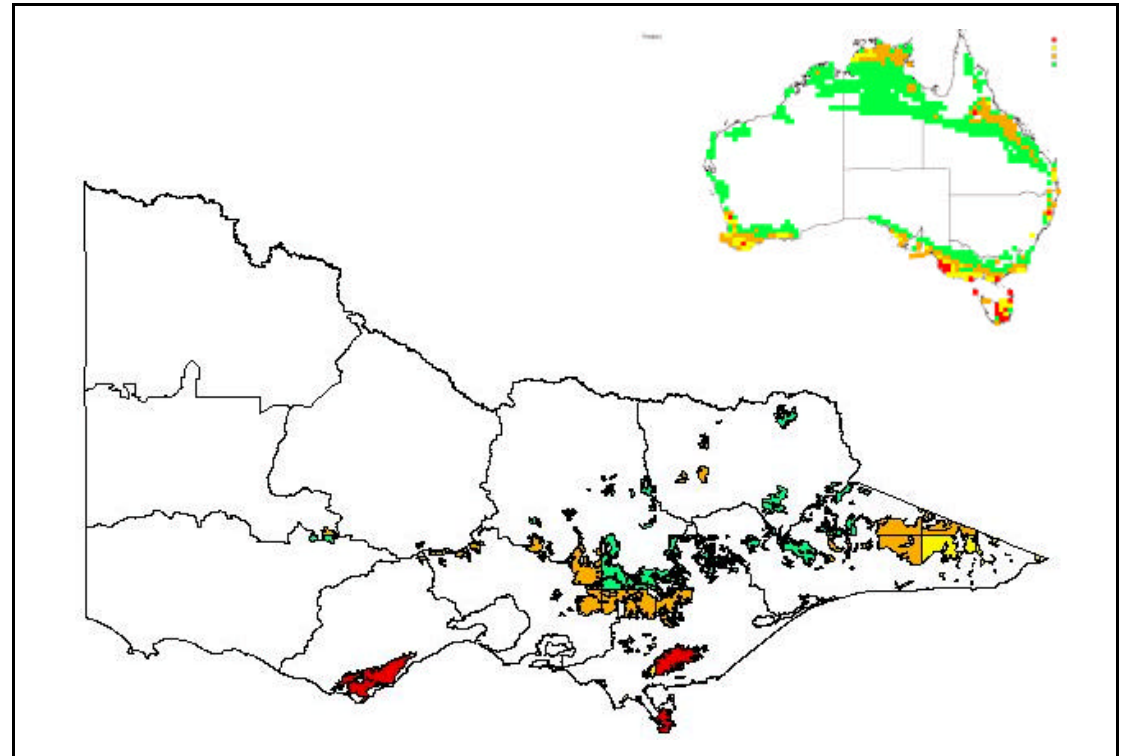
Broad vegetation types

Moist foothill forest; Montane moist forest; Riparian forest

Colours indicate possibility of *Rubus rugosus* infesting these areas.

Red	= Very high	Yellow	= High
Orange	= Medium	Green	= Likely

In the non-coloured areas the plant is unlikely to establish as the climate, soil or landuse is not presently suitable.



Impact Assessment Record

Scientific Name: *Rubus rugosus*

Common name: keriberry

QUESTION	COMMENTS	RATING	CONFIDENCE
Social			
1. Restrict human access?	"Stems sprawl and root where they touch the ground, forming dense, impenetrable thickets...Serious creekline weed...Found in creeks in the Perth area" (Hussey et. al, 1997). Will impede access to waterways.	ML	MH
2. Reduce tourism?	"Stems sprawl and root where they touch the ground, forming dense, impenetrable thickets...Serious creekline weed...Found in creeks in the Perth area" (Hussey et. al, 1997). Grows to 2m tall (anon, 2006). Tall, impenetrable would be obvious to most visitors and would reduce access to waterways for recreation.	MH	MH
3. Injurious to people?	"Prickles few, scattered, almost straight, weak" (Dassanayake & Fosberg 1980). May cause minor damage from small prickles.	ML	H
4. Damage to cultural sites?	"Stems sprawl and root where they touch the ground, forming dense, impenetrable thickets (Hussey et. al, 1997). Grows to 2m tall (anon, 2006). Moderate visual effect.	ML	MH
Abiotic			
5. Impact flow?	Serious creekline weed (Hussey et. al, 1997). Terrestrial species.	L	MH
6. Impact water quality?	Serious creekline weed (Hussey et. al, 1997). Terrestrial species.	L	MH
7. Increase soil erosion?	"Stems sprawl and root where they touch the ground, forming dense, impenetrable thickets...Serious creekline weed...Found in creeks in the Perth area" (Hussey et. al, 1997). Likely to reduce erosion by permanently binding soil over a wide area.	L	MH
8. Reduce biomass?	No information found.	M	L
9. Change fire regime?	No information found.	M	L
Community Habitat			
10. Impact on composition (a) high value EVC	EVC=Cool Temperate Rainforest (V); CMA=Corangamite; Bioreg=Otway Ranges; CLIMATE=VH. No information found.	M	L
(b) medium value EVC	EVC=Warm Temperate Rainforest (R); CMA=West Gippsland; Bioreg=Wilsons Promontory; CLIMATE=VH. No information found.	M	L
(c) low value EVC	EVC=Damp Forest (LC); CMA=West Gippsland; Bioreg=Wilsons Promontory; CLIMATE=VH. No information found.	M	L
11. Impact on structure?	No information found.	M	L

Impact Assessment Record

Scientific Name: *Rubus rugosus*

Common name: keriberry

QUESTION	COMMENTS	RATING	CONFIDENCE
12. Effect on threatened flora?	No information found.	MH	L
Fauna			
13. Effect on threatened fauna?	No information found.	MH	L
14. Effect on non-threatened fauna?	No information found.	M	L
15. Benefits fauna?	No information found.	M	L
16. Injurious to fauna?	“Prickles few, scattered, almost straight, weak” (Dassanayake & Fosberg 1980). May cause minor damage from small prickles.	MH	MH
Pest Animal			
17. Food source to pests?	“New plants are spread from seeds carried by birds and foxes” (Hussey et. al, 1997).	MH	MH
18. Provides harbor?	No information found.	M	L
Agriculture			
19. Impact yield?	No information found.	M	L
20. Impact quality?	No information found.	M	L
21. Affect land value?	No information found.	M	L
22. Change land use?	No information found.	M	L
23. Increase harvest costs?	No information found.	M	L
24. Disease host/vector?	A fungal disease of tea plants has been recorded on this plant, described as a minor root rot in South India (AFFA, 2004).	MH	MH

Impact Assessment Record

Scientific Name: *Rubus rugosus*

Common name: keriberry

References cited:

Anon 2005, *Daleys Fruit Tree Nursery*, Kyogle, NSW, viewed: 31/01/2006, www.daleysfruit.com.au/plant/Keriberry.htm.

Dassanayake, MD & Fosberg, FR (Eds.) 1980, *A revised handbook to the flora of Ceylon*, 2nd ed., Amerind Publishing Co., New Delhi; Springfield, Va.

Department of Agriculture, Fisheries and Forestry (AFFA) 2004, *Longan and lychee fruit from the People's Republic of China and Thailand Final Import Risk Analysis Report Part B*, Commonwealth of Australia.

Hussey BMJ, Keighery GJ, Cousens RD, Dodd J & Lloyd SG 1997, *Western Weeds*, Plant Protection Society of Western Australia, WA.

Revisions

Date	Revised by	Revision

Invasiveness Assessment Record

Scientific name: *Sagittaria* spp.*

Common Name: arrowhead

QUESTION	COMMENTS	RATING	CONFIDENCE
Establishment			
1. Germination requirements?	"Seeds germinate in Spring" (Parsons & Cuthbertson, 2001)	MH	MH
2. Establishment requirements?	6 hours of light or less cause seeds to germinate (Murray-Goulburn Water, draft). "A large amount of stubble can...[shade] arrowhead seeds, slowing germination" (RIRDC, 2000). Require light to germinate (Flower et al, 1999). Less than 10% of seed germinated without light, compared to up to 50-65% with light (Flower et al, 1998). Can establish under moderate cover.	MH	H
3. How much disturbance is required?	"Usually found in warm-temperate shallowly flooded or marshy areas associated with rivers and streams...drainage ditches, rice fields and permanent swamps associated with irrigation drainage systems." (Parsons & Cuthbertson, 1992). All evidence points towards highly disturbed aquatic environments, such as irrigation channels and rice fields.	ML	MH
Growth/Competitive			
4. Life form?	"Emergent, broad-leafed aquatic plant" (Flower et al, 1999)	H	H
5. Allelopathic properties?	None found	L	L
6. Tolerates herb pressure?	Spoonbills and carp have been observed feeding on the plant. Either or both of these animals may have been the cause of the plants disappearance on river flats along the River Murray but this is not certain (Parsons & Cuthbertson, 1992). The weed may still persist.	ML	MH
7. Normal growth rate?	Rice has been observed outgrowing <i>S. montevidensis</i> in California (Gibson et al, 2001) however Australian rice yields can be reduced by up to 75% (Flower et al, 1999). The ability of rice to outcompete arrowhead depends on when it is sown after flooding (Flower et al, 2002). Equal competitiveness of same life forms.	MH	H
8. Stress tolerance to frost, drought, w/logg, sal. etc?	One study showed that draining rice bays for up to two weeks killed very young arrowhead seedlings, but didn't kill more mature seed-grown plants (Flower et al, 1999). Survive in temporary dry ditches (Sagliocco & Bruzzese, 2005). Killed by frost and most plants killed by drought (Kaul, 1985 Angelo & Boufford (2005) record it growing in tidal mud flats of estuaries and salt marshes. The rosette form may be able to tolerate submersion for years (MGW, nd). As a low growing aquatic species (Parsons & Cuthbertson, 1992) will not be affected by fire. Tolerance of fire, waterlogging and salinity, but not frost or drought (severe enough to dry out damp areas).	MH	MH
Reproduction			
9. Reproductive system	"Reproducing by seed and rhizomes" (Parsons & Cuthbertson, 1992)	H	MH
10. Number of propagules produced?	Can produce many thousands of seeds per plant (MGW, nd). 414 000 achenes per plant per year (Kaul, 1985).	H	H
11. Propagule longevity?	"The viability of ...seeds does not reduce significantly after three years in the soil, suggesting that they remain viable for many years after being deposited" (Murray-Goulburn Water, draft). Kaul	ML	H

Invasiveness Assessment Record

Scientific name: *Sagittaria* spp.*

Common Name: arrowhead

QUESTION	COMMENTS	RATING	CONFIDENCE
	(1985) found that scarified seed viability reduced to 50% after 7 years.		
12. Reproductive period?	Species forms dense monocultures, as seen in photograph (Parsons & Cuthbertson, 1992).	H	H
13. Time to reproductive maturity?	“Seeds germinate in spring and plants mature during summer, producing flowers from January to March. Seeds mature in autumn” (Parsons & Cuthbertson, 1992). Kaul (1985) describes <i>S. calycina</i> (syn. for subspecies) as a fruit-bearing annual. “Two subspecies recorded in Australia, one perennial (ssp. <i>Montevidensis</i> and one annual ssp. <i>calycina</i>)” (Murray-Goulburn Water, draft). Produces propagules in under a year.	H	H
Dispersal			
14. Number of mechanisms?	“Under Australian field conditions, spread of arrowhead is by seed. They move in water along channels and ditches and also in mud sticking to hooves and fur of animals...Some seeds are eaten by ducks and believed to be viable when excreted” (Parsons & Cuthbertson, 1992).	H	MH
15. How far do they disperse?	“Under Australian field conditions, spread of arrowhead is by seed. They move in water along channels and ditches and also in mud sticking to hooves and fur of animals” (Parsons & Cuthbertson, 1992) “due to a slightly sticky surface” (Murray-Goulburn Water, draft). “The achenes produced by Alismataceous species have a pericarp that provides buoyancy...those of <i>S. montevidensis</i> float for a little under two weeks.” (Murray-Goulburn Water, draft). Very likely that some propagules will disperse greater than 1km by sticking to animal fur, or transport by water.	H	MH

**Sagittaria* species include (those naturalised in Australia): *S. montevidensis* ssp. *montevidensis*, *S. montevidensis* ssp. *calycina*, *S. platyphylla* & *S. graminea*.

References cited:

- Angelo R & Bouffard DE 2005 *Atlas of the Flora of New England*, Harvard University Herbaria, USA, viewed:15/12/2005, <http://neatlas.huh.harvard.edu/Neatlas2/MonoFam-A-C.html>.
- Flower GE, Pratley JE & Silvapalan S 2002, ‘Arrowhead- are the results of research relevant in the field?’, *Farmers Newsletter*, p. 44-45.
- Flower GE, Pratley JE & Slater PD 1998, ‘What makes arrowhead germinate?’ *Farmers Newsletter*, p. 58-59.
- Flower GE, Pratley JE & Slater PD 1999, ‘Early desiccation as a tool for arrowhead control,’ 12th *Australian Weeds Conference*, Hobart Tasmania p. 543-546.
- Gibson KE, Breen JL, Hill JE, Caton BP & Foin TC 2001, ‘California arrowhead is a weak competitor in water-seeded rice’ *Weed Science*, v. 49 (3) p. 381 – 384.
- Kaul RB, 1985 ‘Reproductive phenology and biology in annual and perennial Alismataceae’ *Aquatic Botany*, 22, p. 153 – 164.
- Mühlenberg H 1980, *The complete guide to water plants*, EP Publishing Ltd, Germany.

Invasiveness Assessment Record

Scientific name: *Sagittaria* spp.*

Common Name: arrowhead

Murray-Goulburn Water (MGW) no date, *Sagittaria* spp. Draft.

Parsons WT & Cuthbertson EG 1992, *Noxious Weeds of Australia* (2nd ed.) CSIRO Publishing, Australia.

RIRDC (Rural Industries Research & Development Corporation) 1999, *Australian Government RIRDC*, RIRDC, Australian Government, Canberra, viewed: 13/12/2005,
<http://www.rirdc.gov.au/comp00/rice2.html#UCS-16A>.

Sagliocco JL & Bruzzese E, 2005 *Nomination of a target weed for biological control* Victorian Department of Primary Industries & Victorian Department of Sustainability and Environment, Australia.

Revisions

Date	Revised by	Revision

Present distribution of *Sagittaria montevidensis* in Victoria

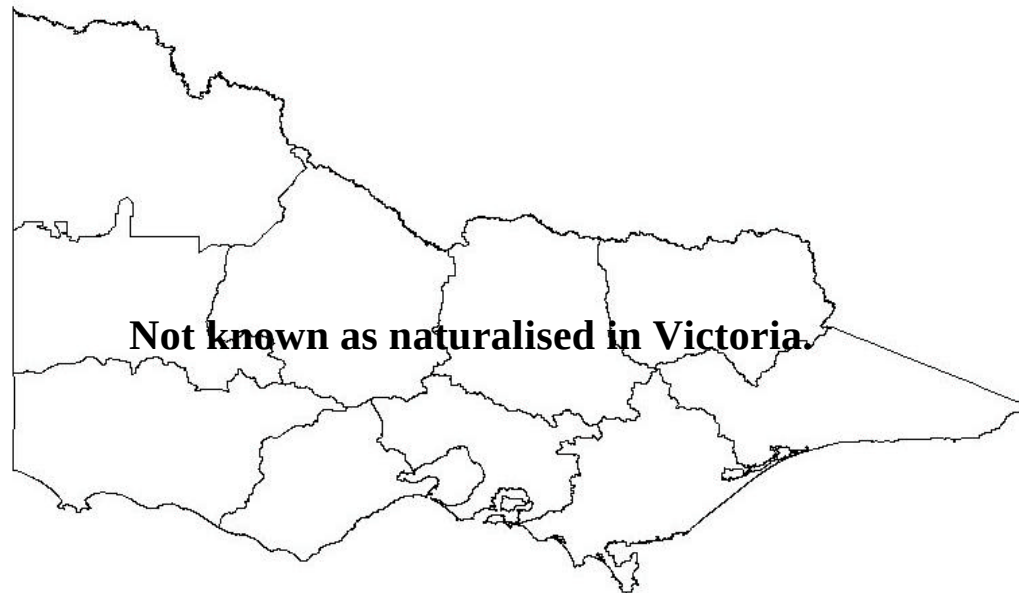
Scientific name: *Sagittaria montevidense* Cham. & Schltdl.

Common name(s): giant arrowhead

Status:

Habitat:

Warm-temperate shallowly flooded or marshy areas associated with rivers and streams. Mostly naturalised as a weed of drainage ditches, rice fields and permanent swamps associated with irrigation drainage systems. (Parsons & Cuthbertson 2001)



Potential distribution of *Sagittaria montevidensis* in Victoria

Scientific name: *Sagittaria montevidense* Cham. & Schltdl.

Common name(s): giant arrowhead

Status:

Habitat:

Warm-temperate shallowly flooded or marshy areas associated with rivers and streams. Mostly naturalised as a weed of drainage ditches, rice fields and permanent swamps associated with irrigation drainage systems. (Parsons & Cuthbertson 2001)

Potential distribution produced from CLIMATE modelling refined by applying suitable landuse and vegetation type overlays with CMA boundaries

MAP OVERLAYS USED.

Land Use:

Broadacre cropping

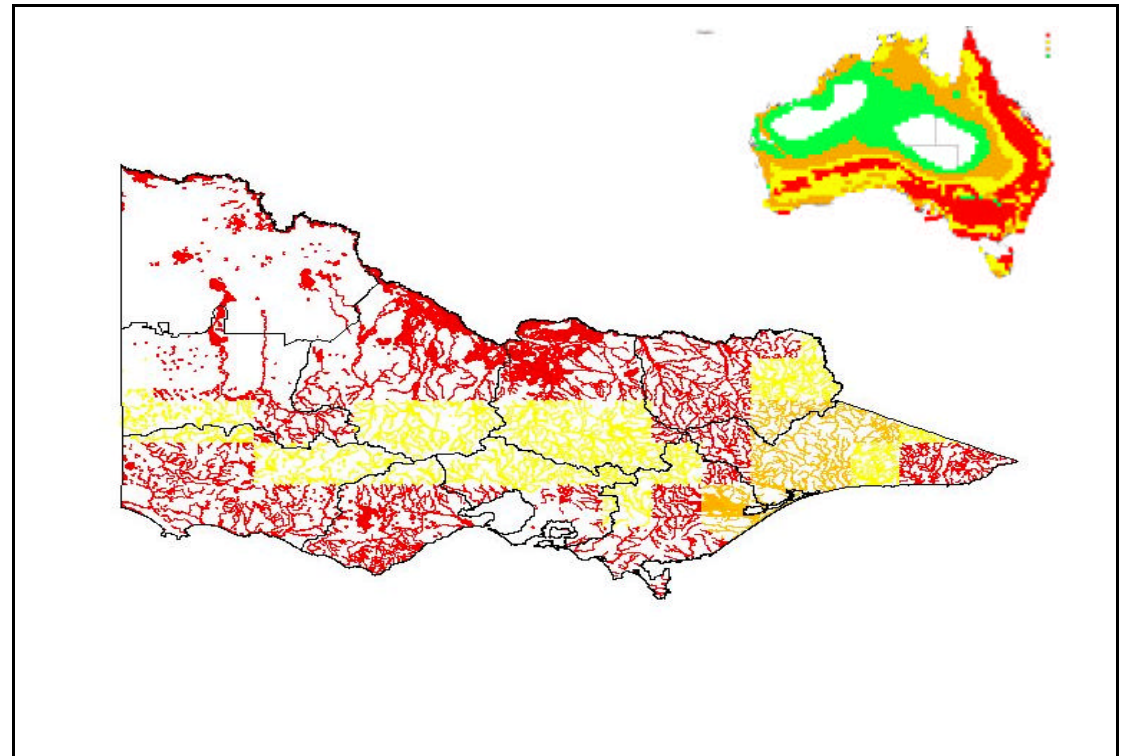
Broad vegetation types

Swamp scrub; riverine grassy woodland; riparian forest

Colours indicate possibility of *Sagittaria montevidensis* infesting these areas.

Red	= Very high	Yellow	= High
Orange	= Medium	Green	= Likely

In the non-coloured areas the plant is unlikely to establish as the climate, soil or landuse is not presently suitable.



Impact Assessment Record

Scientific Name: *Sagittaria* spp.*

Common name: arrowhead

QUESTION	COMMENTS	RATING	CONFIDENCE
Social			
1. Restrict human access?	An emergent aquatic perennial herb. Inhabits shallowly flooded (to 45cm) or marshy areas associated with rivers and streams. In south eastern Australia it is commonly found in drainage ditches and permanent swamps associated with irrigation and drainage systems (Parson & Cuthberston, 1992). Would not impede human access to waterways.	L	MH
2. Reduce tourism?	Although most commonly found in drainage ditches and irrigation canals, it has also been found in a number of creeks in Victoria including Nine Mile Creek, Wunghnu and Bullock Creek near the junction of the Owen and Murray Rivers. In drain and irrigation channels it can form dense infestations that block the flow of water (Parson & Cuthberston, 1992). Its presence may affect water-based activities such as fishing or swimming.	MH	MH
3. Injurious to people?	No prickles, spines or burrs described (Aston, 1973). <i>Sagittaria</i> species are eaten by ducks and sometimes humans, suggesting that they are not toxic either (Parson & Cuthberston, 1992).	L	MH
4. Damage to cultural sites?	An aquatic species (Parson & Cuthberston, 1992). Not likely to impact on sites of cultural significance.	L	MH
Abiotic			
5. Impact flow?	"Sagittaria forms extensive infestations in shallow waterways, seriously restricting water flow and increasing sedimentation, thus aggravating flooding." (BPRC, 2004). An emergent aquatic, firmly rooted. "Dense infestations block channels and drainage ditches" (Parsons & Cuthbertson, 1992). "Arrowhead can severely retard and completely choke water flow in irrigation channels" (Gunasekera & Krake, 2001). Serious impacts to both surface and subsurface water flow.	H	MH
6. Impact water quality?	"Decaying plant material contributes to water pollution and sedimentation and may also increase the risk of algal bloom and microbial activity" (Sagliocco & Bruzesse, 2005). Likely to cause noticeable but minor effects on dissolved O ₂ .	ML	MH
7. Increase soil erosion?	In New Zealand it, "forms extensive infestations in shallow waterways, seriously restricting water flow and increasing sedimentation, thus aggravating flooding" (BPRC, 2004). Increased chance of flooding would create the potential for large-scale soil movement with minor off-site implications.	MH	MH
8. Reduce biomass?	Where it occurs in drainage channels and irrigation canals (Parson & Cuthberston, 1992) little other vegetation would normally exist. Infestations of arrowhead would increase biomass.	ML	MH
9. Change fire regime?	Aquatic species (Flower et al, 1999). Fire not applicable in this ecosystem.	L	H
Community Habitat			
10. Impact on composition (a) high value EVC	Basin=East Gippsland- Cann River (ISC=Excellent); CMA=East Gippsland; CLIMATE=VH. " <i>S. calycina</i> [syn. <i>S. montevidensis</i> ssp. <i>calycina</i>] is very abundant in suitable years, sometimes forming vast beds" (Kaul, 1985). Can displace native water plants which occupy the same habitat (ESC, 2005). Able to form monocultures displacing all species within a layer.	H	MH

Impact Assessment Record

Scientific Name: *Sagittaria* spp.*

Common name: arrowhead

QUESTION	COMMENTS	RATING	CONFIDENCE
(b) medium value EVC	Aquatic species. All Victorian water bodies considered to comprise high value EVCs only (Weiss pers. coms.)i.	L	H
(c) low value EVC	Aquatic species. All Victorian water bodies considered to comprise high value EVCs only (Weiss pers. coms.)ii.	L	H
11. Impact on structure?	" <i>S. calycina</i> [syn. <i>S. montevidensis</i> ssp. <i>calycina</i>] is very abundant in suitable years, sometimes forming vast beds" (Kaul, 1985). Can displace native water plants which occupy the same habitat (ESC, 2005). Able to form monocultures.	H	MH
12. Effect on threatened flora?	No information found.	MH	L
Fauna			
13. Effect on threatened fauna?	No information found.	MH	L
14. Effect on non-threatened fauna?	"Has a negative impact on native species and on the integrity of natural waterways, such as the waterways of the Barmah-Millewa forest, where it has been recorded" (GMW). Large populations obstruct the movement of wildlife and fish (Sagliocco & Bruzzese, 2005). May reduce habitat and have a minor effect on native fauna.	ML	MH
15. Benefits fauna?	Spoonbills have been observed feeding on the plant (Parson & Cuthberston, 1992). The plant may provide an alternate source of food.	MH	MH
16. Injurious to fauna?	No prickles, spines or burrs described (Aston, 1973). Spoonbills and carp have been observed feeding on the plant (Parson & Cuthberston, 1992). Not harmful to fauna.	L	MH
Pest Animal			
17. Food source to pests?	Carp (considered a serious aquatic pest) have been observed feeding on the plant (Parson & Cuthberston, 1992).	MH	MH
18. Provides harbor?	Carp (considered a serious aquatic pest) have been observed feeding on the plant Parson & Cuthberston (1992) and dense infestations (Parsons & Cuthbertson, 1992) may also provide harbor for them.	MH	MH
Agriculture			
19. Impact yield?	"Grain yields were not affected by Californian arrowhead densities up to 200 plants/m ² (Gibson et al, 2001). "Arrowhead reduced the yield of rice by up to 75% if completely unchecked" (Flower, Pratley & Slater, 1999). The ability of rice to outcompete arrowhead depends on when it is sown after flooding (Flower et al, 2002). This species has the capacity to have a serious impact on rice yield.	H	H
20. Impact quality?	"Weed senesced well before rice maturity" (Gibson et al, 2001). Unlikely to impact on the quality of the produce.	L	H
21. Affect land value?	Whilst this species can "severely retard and completely choke water flow in irrigation channels" (Gunasekera & Krake, 2001), it is the responsibility of the water service provider to control the weed (GMW) so is unlikely to have an impact on land value.	L	MH

Impact Assessment Record

Scientific Name: *Sagittaria* spp.*

Common name: arrowhead

QUESTION	COMMENTS	RATING	CONFIDENCE
22. Change land use?	Land use may need to change from rice growing to another crop (see Q. 19), however, this is unlikely to cause a reduction in income.	L	MH
23. Increase harvest costs?	One study showed that draining rice bays for up to two weeks killed very young arrowhead seedlings, but didn't kill more mature seed-grown plants (Flower et al, 1999). Controlling arrowhead this way may cause a minor increase to the costs of harvest.	M	H
24. Disease host/vector?	Harbors several important plant viruses (Parsons & Cuthbertson, 1992).	H	MH

* *Sagittaria* species include (those naturalised in Australia): *S. montevidensis* ssp. *montevidensis*, *S. montevidensis* ssp. *calycina*, *S. platyphylla* & *S. graminea*.

References cited:

- Angelo R & Bouffard DE 2005 *Atlas of the Flora of New England*, Harvard University Herbaria, USA, viewed:15/12/2005, <http://neatlas.huh.harvard.edu/Neatlas2/MonoFam-A-C.html>.
- Aston HI 1973, *Aquatic plants of Australia : a guide to the identification of the aquatic ferns and flowering plants of Australia*, both native and naturalized, Melbourne University Press, Carlton, Vic.
- Bay of Plenty Regional Council (BPRC) 2004, *Sagittaria graminea*, <http://www.envbop.govt.nz/weeds/weed6.asp> viewed 15/11/04
- Eurobodalla Shire Council 2005, (ESC) *Sagittaria*, Eurobodalla Shire Council, NSW, viewed:17/10/2005, <http://www.esc.nsw.gov.au/weeds/Sheets/aquatic/A%20Sagittaria.htm>
- Flower GE, Pratley JE & Silvapalan S 2002, 'Arrowhead- are the results of research relevant in the field?', *Farmers Newsletter*, p. 44-45.
- Flower GE, Pratley JE & Slater PD 1998, 'What makes arrowhead germinate?' *Farmers Newsletter*, p. 58-59.
- Flower GE, Pratley JE & Slater PD 1999, 'Early desiccation as a tool for arrowhead control,' 12th *Australian Weeds Conference*, Hobart Tasmania p. 543-546.
- Gibson KE, Breen JL, Hill JE, Caton BP & Foin TC 2001, 'California arrowhead is a weak competitor in water-seeded rice' *Weed Science*, v. 49 (3) p. 381 – 384.
- Goulburn-Murray Water (GMW) (draft) *Sagittaria spp.*
- Gunasekera L & Krake K 2001, 'Arrowhead- a serious aquatic weed in northern Victoria', *Victorian Landcare and Catchment Management*, vol. 19. p. 7.
- Kaul RB, 1985 'Reproductive phenology and biology in annual and perennial Alismataceae' *Aquatic Botany*, 22, p. 153 – 164.
- Mühlenberg H 1980, *The complete guide to water plants*, EP Publishing Ltd, Germany.
- Parsons WT & Cuthbertson EG 1992, *Noxious Weeds of Australia* (2nd ed.) CSIRO Publishing, Australia.
- RIRDC (Rural Industries Research & Development Corporation) 1999, *Australian Government RIRDC*, RIRDC, Australian Government, Canberra, viewed: 13/12/2005, <http://www.rirc.gov.au/comp00/rice2.html#UCS-16A>.
- Sagliocco JL & Bruzzese E, 2005 *Nomination of a target weed for biological control* Victorian Department of Primary Industries & Victorian Department of Sustainability and Environment, Australia.

Impact Assessment Record

Scientific Name: *Sagittaria* spp.*

Common name: arrowhead

Sainty, G.R. & Jacobs, S.W.L., 1981, *Waterplants of New South Wales*, Water Resources Commission, NSW.

Revisions

Date	Revised by	Revision

i Weiss, J. Project Leader, Pest Plant Impact Assessment. DPI, Frankston. Tel 9785 0111. (11/07/03)

ii Weiss, J. Project Leader, Pest Plant Impact Assessment. DPI, Frankston. Tel 9785 0111. (11/07/03)

Invasiveness Assessment Record

Scientific name: *Sagittaria* spp.*

Common Name: arrowhead

QUESTION	COMMENTS	RATING	CONFIDENCE
Establishment			
1. Germination requirements?	“Seeds germinate in Spring” (Parsons & Cuthbertson, 2001)	MH	MH
2. Establishment requirements?	6 hours of light or less cause seeds to germinate (Murray-Goulburn Water, draft). “A large amount of stubble can...[shade] arrowhead seeds, slowing germination” (RIRDC, 2000). Require light to germinate (Flower et al, 1999). Less than 10% of seed germinated without light, compared to up to 50-65% with light (Flower et al, 1998). Can establish under moderate cover.	MH	H
3. How much disturbance is required?	“Usually found in warm-temperate shallowly flooded or marshy areas associated with rivers and streams...drainage ditches, rice fields and permanent swamps associated with irrigation drainage systems.” (Parsons & Cuthbertson, 1992). All evidence points towards highly disturbed aquatic environments, such as irrigation channels and rice fields.	ML	MH
Growth/Competitive			
4. Life form?	“Emergent, broad-leafed aquatic plant” (Flower et al, 1999)	H	H
5. Allelopathic properties?	None found	L	L
6. Tolerates herb pressure?	Spoonbills and carp have been observed feeding on the plant. Either or both of these animals may have been the cause of the plants disappearance on river flats along the River Murray but this is not certain (Parsons & Cuthbertson, 1992). The weed may still persist.	ML	MH
7. Normal growth rate?	Rice has been observed outgrowing <i>S. montevidensis</i> in California (Gibson et al, 2001) however Australian rice yields can be reduced by up to 75% (Flower et al, 1999). The ability of rice to outcompete arrowhead depends on when it is sown after flooding (Flower et al, 2002). Equal competitiveness of same life forms.	MH	H
8. Stress tolerance to frost, drought, w/logg, sal. etc?	One study showed that draining rice bays for up to two weeks killed very young arrowhead seedlings, but didn’t kill more mature seed-grown plants (Flower et al, 1999). Survive in temporary dry ditches (Sagliocco & Bruzzese, 2005). Killed by frost and most plants killed by drought (Kaul, 1985 Angelo & Boufford (2005) record it growing in tidal mud flats of estuaries and salt marshes. The rosette form may be able to tolerate submersion for years (MGW, nd). As a low growing aquatic species (Parsons & Cuthbertson, 1992) will not be affected by fire. Tolerance of fire, waterlogging and salinity, but not frost or drought (severe enough to dry out damp areas).	MH	MH
Reproduction			
9. Reproductive system	“Reproducing by seed and rhizomes” (Parsons & Cuthbertson, 1992)	H	MH
10. Number of propagules produced?	Can produce many thousands of seeds per plant (MGW, nd). 414 000 achenes per plant per year (Kaul, 1985).	H	H
11. Propagule longevity?	“The viability of ...seeds does not reduce significantly after three years in the soil, suggesting that they remain viable for many years after being deposited” (Murray-Goulburn Water, draft). Kaul	ML	H

Invasiveness Assessment Record

Scientific name: *Sagittaria* spp.*

Common Name: arrowhead

QUESTION	COMMENTS	RATING	CONFIDENCE
	(1985) found that scarified seed viability reduced to 50% after 7 years.		
12. Reproductive period?	Species forms dense monocultures, as seen in photograph (Parsons & Cuthbertson, 1992).	H	H
13. Time to reproductive maturity?	“Seeds germinate in spring and plants mature during summer, producing flowers from January to March. Seeds mature in autumn” (Parsons & Cuthbertson, 1992). Kaul (1985) describes <i>S. calycina</i> (syn. for subspecies) as a fruit-bearing annual. “Two subspecies recorded in Australia, one perennial (ssp. <i>Montevidensis</i> and one annual ssp. <i>calycina</i>)” (Murray-Goulburn Water, draft). Produces propagules in under a year.	H	H
Dispersal			
14. Number of mechanisms?	“Under Australian field conditions, spread of arrowhead is by seed. They move in water along channels and ditches and also in mud sticking to hooves and fur of animals...Some seeds are eaten by ducks and believed to be viable when excreted” (Parsons & Cuthbertson, 1992).	H	MH
15. How far do they disperse?	“Under Australian field conditions, spread of arrowhead is by seed. They move in water along channels and ditches and also in mud sticking to hooves and fur of animals” (Parsons & Cuthbertson, 1992) “due to a slightly sticky surface” (Murray-Goulburn Water, draft). “The achenes produced by Alismataceous species have a pericarp that provides buoyancy...those of <i>S. montevidensis</i> float for a little under two weeks.” (Murray-Goulburn Water, draft). Very likely that some propagules will disperse greater than 1km by sticking to animal fur, or transport by water.	H	MH

**Sagittaria* species include (those naturalised in Australia): *S. montevidensis* ssp. *montevidensis*, *S. montevidensis* ssp. *calycina*, *S. platyphylla* & *S. graminea*.

References cited:

- Angelo R & Bouffard DE 2005 *Atlas of the Flora of New England*, Harvard University Herbaria, USA, viewed:15/12/2005, <http://neatlas.huh.harvard.edu/Neatlas2/MonoFam-A-C.html>.
- Flower GE, Pratley JE & Silvapalan S 2002, ‘Arrowhead- are the results of research relevant in the field?’, *Farmers Newsletter*, p. 44-45.
- Flower GE, Pratley JE & Slater PD 1998, ‘What makes arrowhead germinate?’ *Farmers Newsletter*, p. 58-59.
- Flower GE, Pratley JE & Slater PD 1999, ‘Early desiccation as a tool for arrowhead control,’ 12th *Australian Weeds Conference*, Hobart Tasmania p. 543-546.
- Gibson KE, Breen JL, Hill JE, Caton BP & Foin TC 2001, ‘California arrowhead is a weak competitor in water-seeded rice’ *Weed Science*, v. 49 (3) p. 381 – 384.
- Kaul RB, 1985 ‘Reproductive phenology and biology in annual and perennial Alismataceae’ *Aquatic Botany*, 22, p. 153 – 164.
- Mühlenberg H 1980, *The complete guide to water plants*, EP Publishing Ltd, Germany.

Invasiveness Assessment Record

Scientific name: *Sagittaria* spp.*

Common Name: arrowhead

Murray-Goulburn Water (MGW) no date, *Sagittaria* spp. Draft.

Parsons WT & Cuthbertson EG 1992, *Noxious Weeds of Australia* (2nd ed.) CSIRO Publishing, Australia.

RIRDC (Rural Industries Research & Development Corporation) 1999, *Australian Government RIRDC*, RIRDC, Australian Government, Canberra, viewed: 13/12/2005,
<http://www.rirdc.gov.au/comp00/rice2.html#UCS-16A>.

Sagliocco JL & Bruzzese E, 2005 *Nomination of a target weed for biological control* Victorian Department of Primary Industries & Victorian Department of Sustainability and Environment, Australia.

Revisions

Date	Revised by	Revision

Potential distribution of *Sagittaria platyphylla* in Victoria

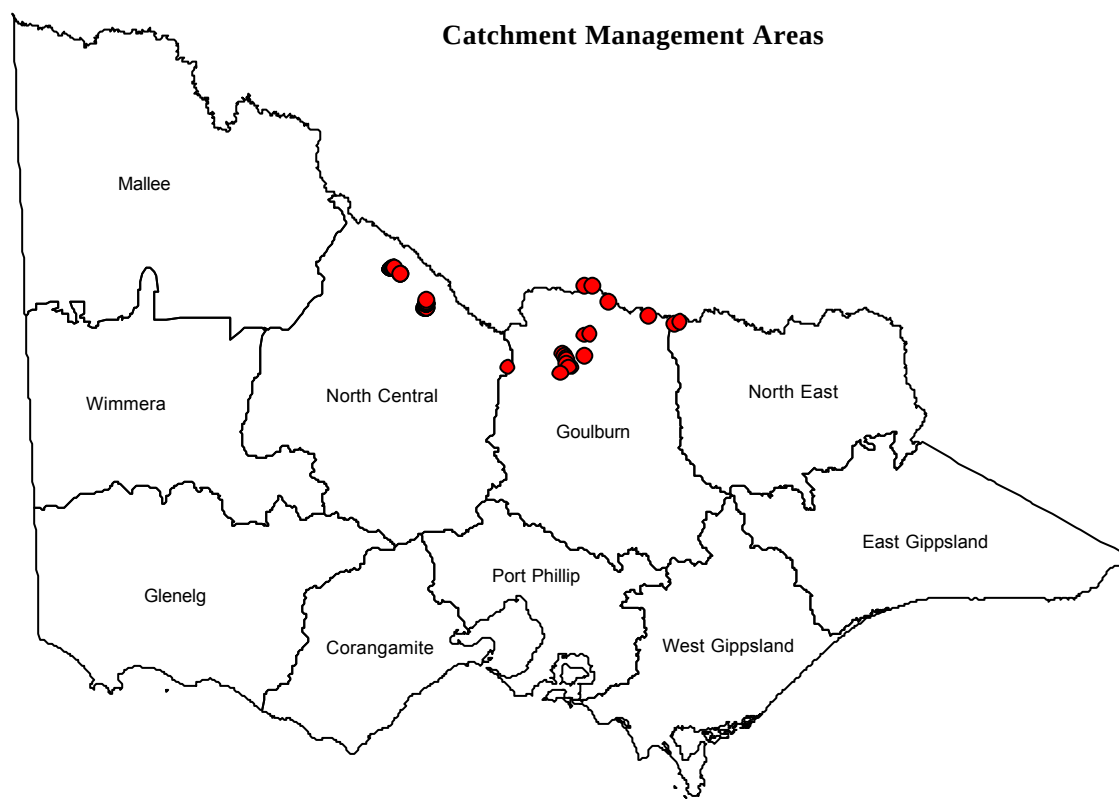
Scientific name: *Sagittaria platyphylla* (Engelm.) J.G.Sm.

Common name(s): sagittaria

Status:

Habitat:

Native to North America. Occurs in lakes, water courses, wetlands. Grows in static or slow-moving water such as drains, streams and pond margins up to a depth of 45cm. In Australia, has become common in irrigation or supply channels, drains, shallow creeks and wetlands (ISSG 2005). Grows in water in depths less than 1 m. Grows along river and creek banks, lagoons, irrigation channels and drains, dams and in wetlands. Well established in Murray Irrigation Area in NSW and Shepparton Irrigation Region in Victoria (Weed CRC).



Potential distribution of *Sagittaria platyphylla* in Victoria

Scientific name: *Sagittaria platyphylla* (Engelm.) J.G.Sm.

Common name(s): sagittaria

Status:

Habitat:

Native to North America. Occurs in lakes, water courses, wetlands. Grows in static or slow-moving water such as drains, streams and pond margins up to a depth of 45cm. In Australia, has become common in irrigation or supply channels, drains, shallow creeks and wetlands (ISSG 2005). Grows in water in depths less than 1 m. Grows along river and creek banks, lagoons, irrigation channels and drains, dams and in wetlands. Well established in Murray Irrigation Area in NSW and Shepparton Irrigation Region in Victoria (Weed CRC).

Potential distribution produced from CLIMATE modelling refined by applying suitable landuse and vegetation type overlays with CMA boundaries

MAP OVERLAYS USED.

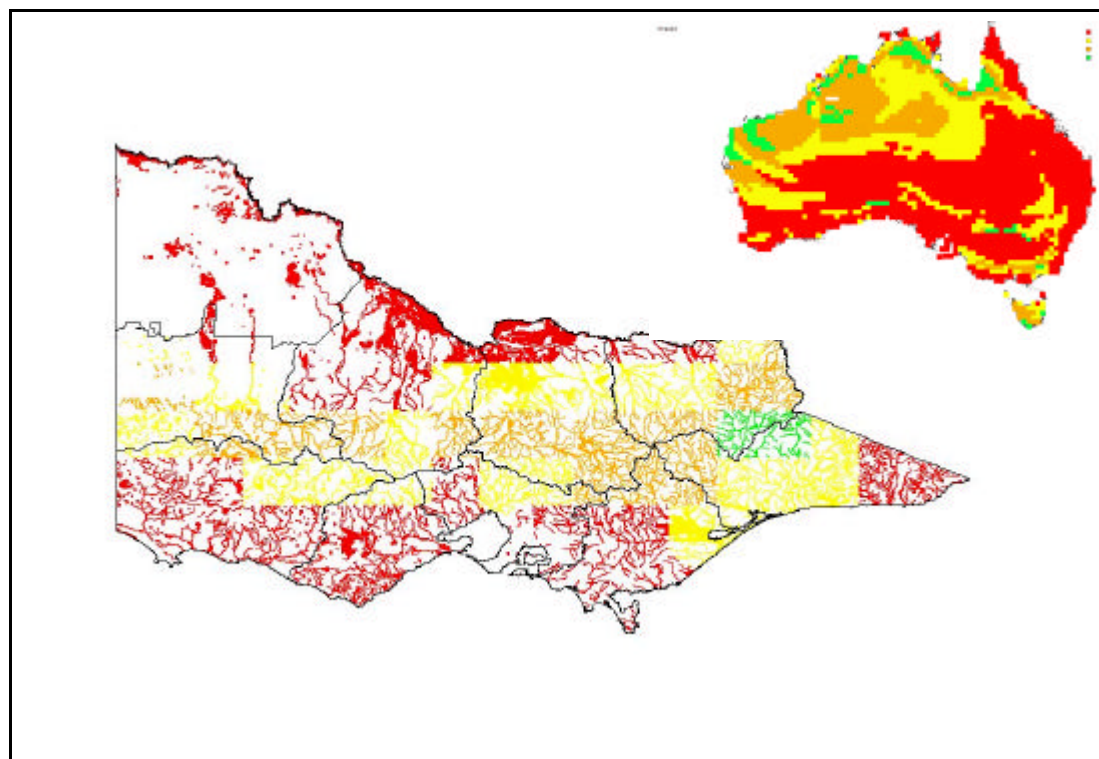
Land Use:

Broad vegetation types

Colours indicate possibility of *Sagittaria platyphylla* infesting these areas.

Red	= Very high	Yellow	= High
Orange	= Medium	Green	= Likely

In the non-coloured areas the plant is unlikely to establish as the climate, soil or landuse is not presently suitable.



Impact Assessment Record

Scientific Name: *Sagittaria* spp.*

Common name: arrowhead

QUESTION	COMMENTS	RATING	CONFIDENCE
Social			
1. Restrict human access?	An emergent aquatic perennial herb. Inhabits shallowly flooded (to 45cm) or marshy areas associated with rivers and streams. In south eastern Australia it is commonly found in drainage ditches and permanent swamps associated with irrigation and drainage systems (Parson & Cuthberston, 1992). Would not impede human access to waterways.	L	MH
2. Reduce tourism?	Although most commonly found in drainage ditches and irrigation canals, it has also been found in a number of creeks in Victoria including Nine Mile Creek, Wunghnu and Bullock Creek near the junction of the Owen and Murray Rivers. In drain and irrigation channels it can form dense infestations that block the flow of water (Parson & Cuthberston, 1992). Its presence may affect water-based activities such as fishing or swimming.	MH	MH
3. Injurious to people?	No prickles, spines or burrs described (Aston, 1973). <i>Sagittaria</i> species are eaten by ducks and sometimes humans, suggesting that they are not toxic either (Parson & Cuthberston, 1992).	L	MH
4. Damage to cultural sites?	An aquatic species (Parson & Cuthberston, 1992). Not likely to impact on sites of cultural significance.	L	MH
Abiotic			
5. Impact flow?	"Sagittaria forms extensive infestations in shallow waterways, seriously restricting water flow and increasing sedimentation, thus aggravating flooding." (BPRC, 2004). An emergent aquatic, firmly rooted. "Dense infestations block channels and drainage ditches" (Parsons & Cuthbertson, 1992). "Arrowhead can severely retard and completely choke water flow in irrigation channels" (Gunasekera & Krake, 2001). Serious impacts to both surface and subsurface water flow.	H	MH
6. Impact water quality?	"Decaying plant material contributes to water pollution and sedimentation and may also increase the risk of algal bloom and microbial activity" (Sagliocco & Bruzesse, 2005). Likely to cause noticeable but minor effects on dissolved O ₂ .	ML	MH
7. Increase soil erosion?	In New Zealand it, "forms extensive infestations in shallow waterways, seriously restricting water flow and increasing sedimentation, thus aggravating flooding" (BPRC, 2004). Increased chance of flooding would create the potential for large-scale soil movement with minor off-site implications.	MH	MH
8. Reduce biomass?	Where it occurs in drainage channels and irrigation canals (Parson & Cuthberston, 1992) little other vegetation would normally exist. Infestations of arrowhead would increase biomass.	ML	MH
9. Change fire regime?	Aquatic species (Flower et al, 1999). Fire not applicable in this ecosystem.	L	H
Community Habitat			
10. Impact on composition (a) high value EVC	Basin=East Gippsland- Cann River (ISC=Excellent); CMA=East Gippsland; CLIMATE=VH. " <i>S. calycina</i> [syn. <i>S. montevidensis</i> ssp. <i>calycina</i>] is very abundant in suitable years, sometimes forming vast beds" (Kaul, 1985). Can displace native water plants which occupy the same habitat (ESC, 2005). Able to form monocultures displacing all species within a layer.	H	MH

Impact Assessment Record

Scientific Name: *Sagittaria* spp.*

Common name: arrowhead

QUESTION	COMMENTS	RATING	CONFIDENCE
(b) medium value EVC	Aquatic species. All Victorian water bodies considered to comprise high value EVCs only (Weiss pers. coms.)i.	L	H
(c) low value EVC	Aquatic species. All Victorian water bodies considered to comprise high value EVCs only (Weiss pers. coms.)ii.	L	H
11. Impact on structure?	" <i>S. calycina</i> [syn. <i>S. montevidensis</i> ssp. <i>calycina</i>] is very abundant in suitable years, sometimes forming vast beds" (Kaul, 1985). Can displace native water plants which occupy the same habitat (ESC, 2005). Able to form monocultures.	H	MH
12. Effect on threatened flora?	No information found.	MH	L
Fauna			
13. Effect on threatened fauna?	No information found.	MH	L
14. Effect on non-threatened fauna?	"Has a negative impact on native species and on the integrity of natural waterways, such as the waterways of the Barmah-Millewa forest, where it has been recorded" (GMW). Large populations obstruct the movement of wildlife and fish (Sagliocco & Bruzzese, 2005). May reduce habitat and have a minor effect on native fauna.	ML	MH
15. Benefits fauna?	Spoonbills have been observed feeding on the plant (Parson & Cuthberston, 1992). The plant may provide an alternate source of food.	MH	MH
16. Injurious to fauna?	No prickles, spines or burrs described (Aston, 1973). Spoonbills and carp have been observed feeding on the plant (Parson & Cuthberston, 1992). Not harmful to fauna.	L	MH
Pest Animal			
17. Food source to pests?	Carp (considered a serious aquatic pest) have been observed feeding on the plant (Parson & Cuthberston, 1992).	MH	MH
18. Provides harbor?	Carp (considered a serious aquatic pest) have been observed feeding on the plant Parson & Cuthberston (1992) and dense infestations (Parsons & Cuthbertson, 1992) may also provide harbor for them.	MH	MH
Agriculture			
19. Impact yield?	"Grain yields were not affected by Californian arrowhead densities up to 200 plants/m ² (Gibson et al, 2001). "Arrowhead reduced the yield of rice by up to 75% if completely unchecked" (Flower, Pratley & Slater, 1999). The ability of rice to outcompete arrowhead depends on when it is sown after flooding (Flower et al, 2002). This species has the capacity to have a serious impact on rice yield.	H	H
20. Impact quality?	"Weed senesced well before rice maturity" (Gibson et al, 2001). Unlikely to impact on the quality of the produce.	L	H
21. Affect land value?	Whilst this species can "severely retard and completely choke water flow in irrigation channels" (Gunasekera & Krake, 2001), it is the responsibility of the water service provider to control the weed (GMW) so is unlikely to have an impact on land value.	L	MH

Impact Assessment Record

Scientific Name: *Sagittaria* spp.*

Common name: arrowhead

QUESTION	COMMENTS	RATING	CONFIDENCE
22. Change land use?	Land use may need to change from rice growing to another crop (see Q. 19), however, this is unlikely to cause a reduction in income.	L	MH
23. Increase harvest costs?	One study showed that draining rice bays for up to two weeks killed very young arrowhead seedlings, but didn't kill more mature seed-grown plants (Flower et al, 1999). Controlling arrowhead this way may cause a minor increase to the costs of harvest.	M	H
24. Disease host/vector?	Harbors several important plant viruses (Parsons & Cuthbertson, 1992).	H	MH

* *Sagittaria* species include (those naturalised in Australia): *S. montevidensis* ssp. *montevidensis*, *S. montevidensis* ssp. *calycina*, *S. platyphylla* & *S. graminea*.

References cited:

- Angelo R & Bouffard DE 2005 *Atlas of the Flora of New England*, Harvard University Herbaria, USA, viewed:15/12/2005, <http://neatlas.huh.harvard.edu/Neatlas2/MonoFam-A-C.html>.
- Aston HI 1973, *Aquatic plants of Australia : a guide to the identification of the aquatic ferns and flowering plants of Australia*, both native and naturalized, Melbourne University Press, Carlton, Vic.
- Bay of Plenty Regional Council (BPRC) 2004, *Sagittaria graminea*, <http://www.envbop.govt.nz/weeds/weed6.asp> viewed 15/11/04
- Eurobodalla Shire Council 2005, (ESC) *Sagittaria*, Eurobodalla Shire Council, NSW, viewed:17/10/2005, <http://www.esc.nsw.gov.au/weeds/Sheets/aquatic/A%20Sagittaria.htm>
- Flower GE, Pratley JE & Silvapalan S 2002, 'Arrowhead- are the results of research relevant in the field?', *Farmers Newsletter*, p. 44-45.
- Flower GE, Pratley JE & Slater PD 1998, 'What makes arrowhead germinate?' *Farmers Newsletter*, p. 58-59.
- Flower GE, Pratley JE & Slater PD 1999, 'Early desiccation as a tool for arrowhead control,' 12th *Australian Weeds Conference*, Hobart Tasmania p. 543-546.
- Gibson KE, Breen JL, Hill JE, Caton BP & Foin TC 2001, 'California arrowhead is a weak competitor in water-seeded rice' *Weed Science*, v. 49 (3) p. 381 – 384.
- Goulburn-Murray Water (GMW) (draft) *Sagittaria spp.*
- Gunasekera L & Krake K 2001, 'Arrowhead- a serious aquatic weed in northern Victoria', *Victorian Landcare and Catchment Management*, vol. 19. p. 7.
- Kaul RB, 1985 'Reproductive phenology and biology in annual and perennial Alismataceae' *Aquatic Botany*, 22, p. 153 – 164.
- Mühlenberg H 1980, *The complete guide to water plants*, EP Publishing Ltd, Germany.
- Parsons WT & Cuthbertson EG 1992, *Noxious Weeds of Australia* (2nd ed.) CSIRO Publishing, Australia.
- RIRDC (Rural Industries Research & Development Corporation) 1999, *Australian Government RIRDC*, RIRDC, Australian Government, Canberra, viewed: 13/12/2005, <http://www.rirc.gov.au/comp00/rice2.html#UCS-16A>.
- Sagliocco JL & Bruzzese E, 2005 *Nomination of a target weed for biological control* Victorian Department of Primary Industries & Victorian Department of Sustainability and Environment, Australia.

Impact Assessment Record

Scientific Name: *Sagittaria* spp.*

Common name: arrowhead

Sainty, G.R. & Jacobs, S.W.L., 1981, *Waterplants of New South Wales*, Water Resources Commission, NSW.

Revisions

Date	Revised by	Revision

i Weiss, J. Project Leader, Pest Plant Impact Assessment. DPI, Frankston. Tel 9785 0111. (11/07/03)

ii Weiss, J. Project Leader, Pest Plant Impact Assessment. DPI, Frankston. Tel 9785 0111. (11/07/03)

Invasiveness Assessment Record

Scientific name: *Sagittaria* spp.*

Common Name: arrowhead

QUESTION	COMMENTS	RATING	CONFIDENCE
Establishment			
1. Germination requirements?	"Seeds germinate in Spring" (Parsons & Cuthbertson, 2001)	MH	MH
2. Establishment requirements?	6 hours of light or less cause seeds to germinate (Murray-Goulburn Water, draft). "A large amount of stubble can...[shade] arrowhead seeds, slowing germination" (RIRDC, 2000). Require light to germinate (Flower et al, 1999). Less than 10% of seed germinated without light, compared to up to 50-65% with light (Flower et al, 1998). Can establish under moderate cover.	MH	H
3. How much disturbance is required?	"Usually found in warm-temperate shallowly flooded or marshy areas associated with rivers and streams...drainage ditches, rice fields and permanent swamps associated with irrigation drainage systems." (Parsons & Cuthbertson, 1992). All evidence points towards highly disturbed aquatic environments, such as irrigation channels and rice fields.	ML	MH
Growth/Competitive			
4. Life form?	"Emergent, broad-leafed aquatic plant" (Flower et al, 1999)	H	H
5. Allelopathic properties?	None found	L	L
6. Tolerates herb pressure?	Spoonbills and carp have been observed feeding on the plant. Either or both of these animals may have been the cause of the plants disappearance on river flats along the River Murray but this is not certain (Parsons & Cuthbertson, 1992). The weed may still persist.	ML	MH
7. Normal growth rate?	Rice has been observed outgrowing <i>S. montevidensis</i> in California (Gibson et al, 2001) however Australian rice yields can be reduced by up to 75% (Flower et al, 1999). The ability of rice to outcompete arrowhead depends on when it is sown after flooding (Flower et al, 2002). Equal competitiveness of same life forms.	MH	H
8. Stress tolerance to frost, drought, w/logg, sal. etc?	One study showed that draining rice bays for up to two weeks killed very young arrowhead seedlings, but didn't kill more mature seed-grown plants (Flower et al, 1999). Survive in temporary dry ditches (Sagliocco & Bruzzese, 2005). Killed by frost and most plants killed by drought (Kaul, 1985 Angelo & Boufford (2005) record it growing in tidal mud flats of estuaries and salt marshes. The rosette form may be able to tolerate submersion for years (MGW, nd). As a low growing aquatic species (Parsons & Cuthbertson, 1992) will not be affected by fire. Tolerance of fire, waterlogging and salinity, but not frost or drought (severe enough to dry out damp areas).	MH	MH
Reproduction			
9. Reproductive system	"Reproducing by seed and rhizomes" (Parsons & Cuthbertson, 1992)	H	MH
10. Number of propagules produced?	Can produce many thousands of seeds per plant (MGW, nd). 414 000 achenes per plant per year (Kaul, 1985).	H	H
11. Propagule longevity?	"The viability of ...seeds does not reduce significantly after three years in the soil, suggesting that they remain viable for many years after being deposited" (Murray-Goulburn Water, draft). Kaul	ML	H

Invasiveness Assessment Record

Scientific name: *Sagittaria* spp.*

Common Name: arrowhead

QUESTION	COMMENTS	RATING	CONFIDENCE
	(1985) found that scarified seed viability reduced to 50% after 7 years.		
12. Reproductive period?	Species forms dense monocultures, as seen in photograph (Parsons & Cuthbertson, 1992).	H	H
13. Time to reproductive maturity?	“Seeds germinate in spring and plants mature during summer, producing flowers from January to March. Seeds mature in autumn” (Parsons & Cuthbertson, 1992). Kaul (1985) describes <i>S. calycina</i> (syn. for subspecies) as a fruit-bearing annual. “Two subspecies recorded in Australia, one perennial (ssp. <i>Montevidensis</i> and one annual ssp. <i>calycina</i>)” (Murray-Goulburn Water, draft). Produces propagules in under a year.	H	H
Dispersal			
14. Number of mechanisms?	“Under Australian field conditions, spread of arrowhead is by seed. They move in water along channels and ditches and also in mud sticking to hooves and fur of animals...Some seeds are eaten by ducks and believed to be viable when excreted” (Parsons & Cuthbertson, 1992).	H	MH
15. How far do they disperse?	“Under Australian field conditions, spread of arrowhead is by seed. They move in water along channels and ditches and also in mud sticking to hooves and fur of animals” (Parsons & Cuthbertson, 1992) “due to a slightly sticky surface” (Murray-Goulburn Water, draft). “The achenes produced by Alismataceous species have a pericarp that provides buoyancy...those of <i>S. montevidensis</i> float for a little under two weeks.” (Murray-Goulburn Water, draft). Very likely that some propagules will disperse greater than 1km by sticking to animal fur, or transport by water.	H	MH

**Sagittaria* species include (those naturalised in Australia): *S. montevidensis* ssp. *montevidensis*, *S. montevidensis* ssp. *calycina*, *S. platyphylla* & *S. graminea*.

References cited:

- Angelo R & Bouffard DE 2005 *Atlas of the Flora of New England*, Harvard University Herbaria, USA, viewed:15/12/2005, <http://neatlas.huh.harvard.edu/Neatlas2/MonoFam-A-C.html>.
- Flower GE, Pratley JE & Silvapalan S 2002, ‘Arrowhead- are the results of research relevant in the field?’, *Farmers Newsletter*, p. 44-45.
- Flower GE, Pratley JE & Slater PD 1998, ‘What makes arrowhead germinate?’ *Farmers Newsletter*, p. 58-59.
- Flower GE, Pratley JE & Slater PD 1999, ‘Early desiccation as a tool for arrowhead control,’ *12th Australian Weeds Conference*, Hobart Tasmania p. 543-546.
- Gibson KE, Breen JL, Hill JE, Caton BP & Foin TC 2001, ‘California arrowhead is a weak competitor in water-seeded rice’ *Weed Science*, v. 49 (3) p. 381 – 384.
- Kaul RB, 1985 ‘Reproductive phenology and biology in annual and perennial Alismataceae’ *Aquatic Botany*, 22, p. 153 – 164.
- Mühlenberg H 1980, *The complete guide to water plants*, EP Publishing Ltd, Germany.
- Murray-Goulburn Water (MGW) no date, *Sagittaria* spp. Draft.
- Parsons WT & Cuthbertson EG 1992, *Noxious Weeds of Australia* (2nd ed.) CSIRO Publishing, Australia.
- RIRDC (Rural Industries Research & Development Corporation) 1999, *Australian Government RIRDC*, RIRDC, Australian Government, Canberra, viewed: 13/12/2005, <http://www.rirdc.gov.au/comp00/rice2.html#UCS-16A>.
- Sagliocco JL & Bruzzese E, 2005 *Nomination of a target weed for biological control* Victorian Department of Primary Industries & Victorian Department of Sustainability and Environment, Australia.

Invasiveness Assessment Record

Scientific name: *Sagittaria* spp.*

Common Name: arrowhead

Revisions		
Date	Revised by	Revision

Present distribution of *Sagittaria pygmaea* in Victoria

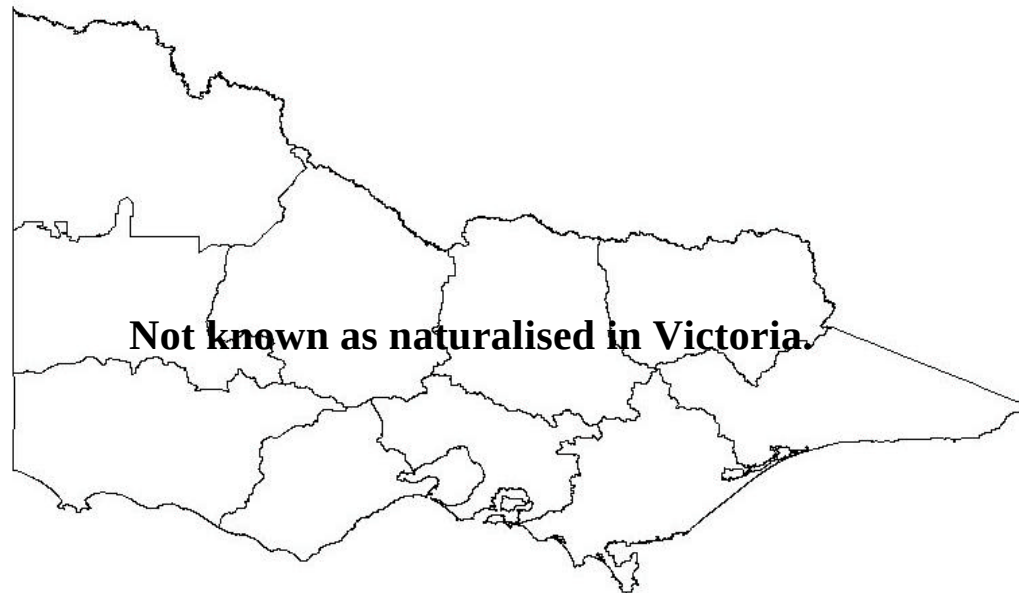
Scientific name: *Sagittaria pygmaea* Miq.

Common name(s): dwarf arrowhead, pygmy arrowhead

Status:

Habitat:

Native to temperate Asia (China, Japan, Korea and Taiwan).



Potential distribution of *Sagittaria pygmaea* in Victoria

Scientific name: *Sagittaria pygmaea* Miq.

Common name(s): dwarf arrowhead, pygmy arrowhead

Status:

Habitat:

Native to temperate Asia (China, Japan, Korea and Taiwan).

Potential distribution produced from CLIMATE modelling refined by applying suitable landuse and vegetation type overlays with CMA boundaries

MAP OVERLAYS USED.

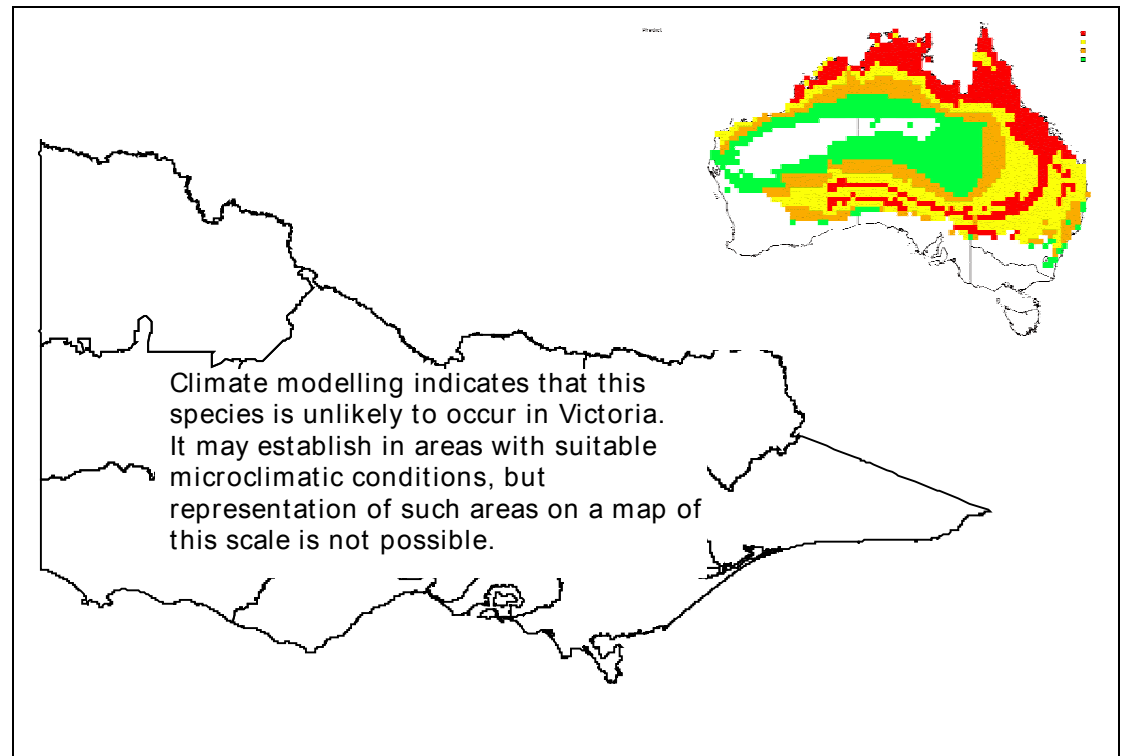
Land Use:

Broad vegetation types

Colours indicate possibility of *Sagittaria pygmaea* infesting these areas.

Red	= Very high	Yellow	= High
Orange	= Medium	Green	= Likely

In the non-coloured areas the plant is unlikely to establish as the climate, soil or landuse is not presently suitable.



Impact Assessment Record

Scientific Name: *Sagittaria* spp.*

Common name: arrowhead

QUESTION	COMMENTS	RATING	CONFIDENCE
Social			
1. Restrict human access?	An emergent aquatic perennial herb. Inhabits shallowly flooded (to 45cm) or marshy areas associated with rivers and streams. In south eastern Australia it is commonly found in drainage ditches and permanent swamps associated with irrigation and drainage systems (Parson & Cuthberston, 1992). Would not impede human access to waterways.	L	MH
2. Reduce tourism?	Although most commonly found in drainage ditches and irrigation canals, it has also been found in a number of creeks in Victoria including Nine Mile Creek, Wunghnu and Bullock Creek near the junction of the Owen and Murray Rivers. In drain and irrigation channels it can form dense infestations that block the flow of water (Parson & Cuthberston, 1992). Its presence may affect water-based activities such as fishing or swimming.	MH	MH
3. Injurious to people?	No prickles, spines or burrs described (Aston, 1973). <i>Sagittaria</i> species are eaten by ducks and sometimes humans, suggesting that they are not toxic either (Parson & Cuthberston, 1992).	L	MH
4. Damage to cultural sites?	An aquatic species (Parson & Cuthberston, 1992). Not likely to impact on sites of cultural significance.	L	MH
Abiotic			
5. Impact flow?	"Sagittaria forms extensive infestations in shallow waterways, seriously restricting water flow and increasing sedimentation, thus aggravating flooding." (BPRC, 2004). An emergent aquatic, firmly rooted. "Dense infestations block channels and drainage ditches" (Parsons & Cuthbertson, 1992). "Arrowhead can severely retard and completely choke water flow in irrigation channels" (Gunasekera & Krake, 2001). Serious impacts to both surface and subsurface water flow.	H	MH
6. Impact water quality?	"Decaying plant material contributes to water pollution and sedimentation and may also increase the risk of algal bloom and microbial activity" (Sagliocco & Bruzesse, 2005). Likely to cause noticeable but minor effects on dissolved O ₂ .	ML	MH
7. Increase soil erosion?	In New Zealand it, "forms extensive infestations in shallow waterways, seriously restricting water flow and increasing sedimentation, thus aggravating flooding" (BPRC, 2004). Increased chance of flooding would create the potential for large-scale soil movement with minor off-site implications.	MH	MH
8. Reduce biomass?	Where it occurs in drainage channels and irrigation canals (Parson & Cuthberston, 1992) little other vegetation would normally exist. Infestations of arrowhead would increase biomass.	ML	MH
9. Change fire regime?	Aquatic species (Flower et al, 1999). Fire not applicable in this ecosystem.	L	H
Community Habitat			
10. Impact on composition (a) high value EVC	Basin=East Gippsland- Cann River (ISC=Excellent); CMA=East Gippsland; CLIMATE=VH. " <i>S. calycina</i> [syn. <i>S. montevidensis</i> ssp. <i>calycina</i>] is very abundant in suitable years, sometimes forming vast beds" (Kaul, 1985). Can displace native water plants which occupy the same habitat (ESC, 2005). Able to form monocultures displacing all species within a layer.	H	MH

Impact Assessment Record

Scientific Name: *Sagittaria* spp.*

Common name: arrowhead

QUESTION	COMMENTS	RATING	CONFIDENCE
(b) medium value EVC	Aquatic species. All Victorian water bodies considered to comprise high value EVCs only (Weiss pers. coms.)i.	L	H
(c) low value EVC	Aquatic species. All Victorian water bodies considered to comprise high value EVCs only (Weiss pers. coms.)ii.	L	H
11. Impact on structure?	" <i>S. calycina</i> [syn. <i>S. montevidensis</i> ssp. <i>calycina</i>] is very abundant in suitable years, sometimes forming vast beds" (Kaul, 1985). Can displace native water plants which occupy the same habitat (ESC, 2005). Able to form monocultures.	H	MH
12. Effect on threatened flora?	No information found.	MH	L
Fauna			
13. Effect on threatened fauna?	No information found.	MH	L
14. Effect on non-threatened fauna?	"Has a negative impact on native species and on the integrity of natural waterways, such as the waterways of the Barmah-Millewa forest, where it has been recorded" (GMW). Large populations obstruct the movement of wildlife and fish (Sagliocco & Bruzzese, 2005). May reduce habitat and have a minor effect on native fauna.	ML	MH
15. Benefits fauna?	Spoonbills have been observed feeding on the plant (Parson & Cuthberston, 1992). The plant may provide an alternate source of food.	MH	MH
16. Injurious to fauna?	No prickles, spines or burrs described (Aston, 1973). Spoonbills and carp have been observed feeding on the plant (Parson & Cuthberston, 1992). Not harmful to fauna.	L	MH
Pest Animal			
17. Food source to pests?	Carp (considered a serious aquatic pest) have been observed feeding on the plant (Parson & Cuthberston, 1992).	MH	MH
18. Provides harbor?	Carp (considered a serious aquatic pest) have been observed feeding on the plant Parson & Cuthberston (1992) and dense infestations (Parsons & Cuthbertson, 1992) may also provide harbor for them.	MH	MH
Agriculture			
19. Impact yield?	"Grain yields were not affected by Californian arrowhead densities up to 200 plants/m ² (Gibson et al, 2001). "Arrowhead reduced the yield of rice by up to 75% if completely unchecked" (Flower, Pratley & Slater, 1999). The ability of rice to outcompete arrowhead depends on when it is sown after flooding (Flower et al, 2002). This species has the capacity to have a serious impact on rice yield.	H	H
20. Impact quality?	"Weed senesced well before rice maturity" (Gibson et al, 2001). Unlikely to impact on the quality of the produce.	L	H
21. Affect land value?	Whilst this species can "severely retard and completely choke water flow in irrigation channels" (Gunasekera & Krake, 2001), it is the responsibility of the water service provider to control the weed (GMW) so is unlikely to have an impact on land value.	L	MH

Impact Assessment Record

Scientific Name: *Sagittaria* spp.*

Common name: arrowhead

QUESTION	COMMENTS	RATING	CONFIDENCE
22. Change land use?	Land use may need to change from rice growing to another crop (see Q. 19), however, this is unlikely to cause a reduction in income.	L	MH
23. Increase harvest costs?	One study showed that draining rice bays for up to two weeks killed very young arrowhead seedlings, but didn't kill more mature seed-grown plants (Flower et al, 1999). Controlling arrowhead this way may cause a minor increase to the costs of harvest.	M	H
24. Disease host/vector?	Harbors several important plant viruses (Parsons & Cuthbertson, 1992).	H	MH

* *Sagittaria* species include (those naturalised in Australia): *S. montevidensis* ssp. *montevidensis*, *S. montevidensis* ssp. *calycina*, *S. platyphylla* & *S. graminea*.

References cited:

- Angelo R & Bouffard DE 2005 *Atlas of the Flora of New England*, Harvard University Herbaria, USA, viewed:15/12/2005, <http://neatlas.huh.harvard.edu/Neatlas2/MonoFam-A-C.html>.
- Aston HI 1973, *Aquatic plants of Australia : a guide to the identification of the aquatic ferns and flowering plants of Australia*, both native and naturalized, Melbourne University Press, Carlton, Vic.
- Bay of Plenty Regional Council (BPRC) 2004, *Sagittaria graminea*, <http://www.envbop.govt.nz/weeds/weed6.asp> viewed 15/11/04
- Eurobodalla Shire Council 2005, (ESC) *Sagittaria*, Eurobodalla Shire Council, NSW, viewed:17/10/2005, <http://www.esc.nsw.gov.au/weeds/Sheets/aquatic/A%20Sagittaria.htm>
- Flower GE, Pratley JE & Silvapalan S 2002, 'Arrowhead- are the results of research relevant in the field?', *Farmers Newsletter*, p. 44-45.
- Flower GE, Pratley JE & Slater PD 1998, 'What makes arrowhead germinate?' *Farmers Newsletter*, p. 58-59.
- Flower GE, Pratley JE & Slater PD 1999, 'Early desiccation as a tool for arrowhead control,' 12th *Australian Weeds Conference*, Hobart Tasmania p. 543-546.
- Gibson KE, Breen JL, Hill JE, Caton BP & Foin TC 2001, 'California arrowhead is a weak competitor in water-seeded rice' *Weed Science*, v. 49 (3) p. 381 – 384.
- Goulburn-Murray Water (GMW) (draft) *Sagittaria* spp.
- Gunasekera L & Krake K 2001, 'Arrowhead- a serious aquatic weed in northern Victoria', *Victorian Landcare and Catchment Management*, vol. 19. p. 7.
- Kaul RB, 1985 'Reproductive phenology and biology in annual and perennial Alismataceae' *Aquatic Botany*, 22, p. 153 – 164.
- Mühlenberg H 1980, *The complete guide to water plants*, EP Publishing Ltd, Germany.
- Parsons WT & Cuthbertson EG 1992, *Noxious Weeds of Australia* (2nd ed.) CSIRO Publishing, Australia.
- RIRDC (Rural Industries Research & Development Corporation) 1999, *Australian Government RIRDC*, RIRDC, Australian Government, Canberra, viewed: 13/12/2005, <http://www.rirc.gov.au/comp00/rice2.html#UCS-16A>.
- Sagliocco JL & Bruzzese E, 2005 *Nomination of a target weed for biological control* Victorian Department of Primary Industries & Victorian Department of Sustainability and Environment, Australia.

Impact Assessment Record

Scientific Name: *Sagittaria* spp.*

Common name: arrowhead

Sainty, G.R. & Jacobs, S.W.L., 1981, *Waterplants of New South Wales*, Water Resources Commission, NSW.

Revisions

Date	Revised by	Revision

i Weiss, J. Project Leader, Pest Plant Impact Assessment. DPI, Frankston. Tel 9785 0111. (11/07/03)

ii Weiss, J. Project Leader, Pest Plant Impact Assessment. DPI, Frankston. Tel 9785 0111. (11/07/03)

Invasiveness Assessment Record

Scientific name: *Salix alba*

Common Name: white willow

QUESTION	COMMENTS	RATING	CONFIDENCE
Establishment			
1. Germination requirements?	“The ‘fragility’...of willows varies greatly and this is the single most important attribute conferring invasibility...by vegetative means.” The most fragile taxa include: <i>Salix fragilis</i> , <i>S. x rubens</i> , <i>S. x pendulina</i> , <i>S. alba</i> , <i>S. x sepulcralis</i> , and <i>S. matsudana</i> ‘ <i>Torulosa</i> . They take root where they lodge in water or on wet ground (Ladson et al, 1997)ie. opportunistic species.	H	MH
2. Establishment requirements?	Willows are described as heliophyllic (intolerant of shade) (Haines, 2004) and most species ...must not be overhung by larger plants or trees (Newsholme, 1992).	ML	MH
3. How much disturbance is required?	The willows that establish predominantly vegetatively tend to “invade riverbanks, lakesides, drainage channels, swaps, almost all wet places (Webb, Sykes & Garnock-Jones, 1988) that are, by their nature, disturbed ecosystems: <i>Salix fragilis</i> , <i>S. x rubens</i> , <i>S. x pendulina</i> , <i>S. alba</i> , <i>S. x sepulcralis</i> , and <i>S. matsudana</i> ‘ <i>Torulosa</i> (Ladson et al, 1997).	MH	MH
Growth/Competitive			
4. Life form?	Semi-aquatic- All willows are described as growing on the banks of water courses or in moist locations. <i>S. alba</i> grows in riverbeds, along drains, riverbanks, lakesides, around ponds (Webb, Sykes & Garnock-Jones, 1988). Invades riparian vegetation, and seasonal and permanent freshwater wetland (Carr et al, 1992), edges of lakes, rivers and streams (Davis, 1982).	H	MH
5. Allelopathic properties?	Of the naturalised willows in Australia, allelopathic compounds have been demonstrated in <i>S. rubra</i> (Bokarev, Kefeli & Kapeljusnikova, 1966), <i>S. babylonica</i> (Koul et al, 1991), <i>S. fragilis</i> (Davison, 1965), <i>S. viminalis</i> (Bowen & Hoad, 1968), <i>S. alba</i> (Banzhaf et al, 1983) and <i>S. purpurea</i> (Gilliver, 1947).	MH	H
6. Tolerates herb pressure?	No information	M	L
7. Normal growth rate?	“ <i>Salix</i> are fast growing trees or shrubs, rarely prostrate” (Spencer, 1997). Where growth rates are described, tree and shrub forms of <i>Salix</i> are recorded as vigorous or fast growing, eg. <i>S. alba</i> (Spencer, 1997), <i>S. glaucophylloides</i> (Newsholme, 1992), <i>S. nigra</i> (Cremer, 1995), <i>S. purpurea</i> (Webb, Sykes & Garnock-Jones, 1988) and <i>S. x rubens</i> (Meikle).	H	MH

Invasiveness Assessment Record

Scientific name: *Salix alba*

Common Name: white willow

QUESTION	COMMENTS	RATING	CONFIDENCE
8. Stress tolerance to frost, drought, w/logg, sal. etc?	FIRE “If a tree is completely girdled by fire at ground level it may die without coppicing...however young trees tend to sprout from the buried portion of their stem” (Cremer, 1999), indicating some fire tolerance in tree and shrub willows in general. FROST All tree and shrub species (except <i>S. humboldtiana</i>) in this study are recorded as tolerating USDA hardiness zones of between 1 and 6 (average minimum temperatures between –46C and –17C) (Bailey & Bailey, 1976, Griffiths, 1992). <i>S. humboldtiana</i> is susceptible to frost (Newsholme, 1992). DROUGHT All willows are described as growing on the banks or in the riverbeds of water courses or in moist locations (Carr, 1996; Carr et. al, 1992; Cody, 1996; Davis, 1982; Howard, 1988; Ladson, et al, 1997; Maloney et al, 1999; Munz, 1963; Voss, 1972; Webb, Sykes & Garnock-Jones, 1988) suggesting a low drought tolerance; and only few species (<i>S. cinerea</i> and <i>S. exigua</i>) can also establish on drier soil (but are not necessarily drought tolerant), with <i>S. purpurea</i> alone tolerating extremely dry, sandy soils (Newsholme, 1992). WATERLOGGING Those species able to grow in riverbeds must have high tolerance of waterlogging (<i>S. exigua</i>, Cody, 1996; <i>S. fragilis</i>, Maloney et al, 1999; <i>S. alba</i>, <i>S.x rubens</i>, and <i>S. viminalis</i>; Webb, Sykes & Garnock-Jones, 1988) and also <i>S. cinerea</i> (Cremer, 1999). SALINITY <i>S. alba</i> is “the most tolerant of all willows to brackish water” (Zallar). <i>S. cinerea</i> “tolerates salt-laden air” (Newsholme, 1992), <i>S. fragilis</i>, <i>S. matsudana</i> & <i>S. seringeana</i> tolerate high levels of salinity (Crouch & Honeyman, 1986). <i>S. nigra</i> has moderately high tolerance of salt (Swift, 1997) and <i>S. purpurea</i> shows “considerable tolerance for salt water” (Newsholme, 1992). <i>S. alba</i> are highly tolerant of waterlogging, salinity and frost, have some tolerance of fire, but not of drought.	MH	MH
Reproduction			
9. Reproductive system	“Vegetatively naturalised for the most part...populations are frequent but not large as the twigs are not very brittle. Abundantly recruiting from seed in some locations (Carr, 1996). “A common source of seedlings in rivers” (Cremer, 1995). Reproduces by seed and vegetatively.	H	MH
10. Number of propagules produced?	“A large crown would produce over 500 000 seeds (Cremer, 1999). Seeds numerous, very small, each with a tuft of long hairs (Tutin, 1993).	H	MH
11. Propagule longevity?	“Willow seed is very short-lived” with longer-lived species recorded at surviving 8-10 weeks (Cremer, 1999).	L	MH
12. Reproductive period?	Following reproductive maturity “flowering tends to be ample and to occur every year” (Cremer, 1999). <i>S. cinerea</i> “stands are mostly monoculture excluding 97% of sunlight and most other species” (Cremer, 1999). The oldest stem <i>S. exigua</i> in this study was 31 years (Ottenbreit & Staniforth, 1992). An old <i>S. fragilis</i> tree was observed to 130 years (Meikle, 1984).	H	MH

Invasiveness Assessment Record

Scientific name: *Salix alba*

Common Name: white willow

QUESTION	COMMENTS	RATING	CONFIDENCE
13. Time to reproductive maturity?	“Flowering and the production of viable seed may begin two to three years after germination, provided the plant is at least 1m tall if it is a shrub willow, or 2m tall if it is a tree willow...In some taxa (eg. <i>S. alba</i>) flowering tends to begin at larger sizes” (Cremer, 1999), which is probably still within 5 years. For plants that have reproduced vegetatively, this may be reduced, as in <i>S. nigra</i>, observed flowering on cuttings produced from < 1 year old growth (Crouch & Honeyman, 1986).	ML	MH
Dispersal			
14. Number of mechanisms?	Vegetative propagules and seed spread by water. “Seed is easily carried by wind” (Cremer, 1999).	H	MH
15. How far do they disperse?	In species where vegetative reproduction predominates, such as <i>S. alba</i> (Carr, 1996), <i>S. x rubens</i> provides evidence that “very few individuals observed long distances from existing mature trees and these were downstream of cities, towns and homesteads” (Shafroth et al, 1994).	MH	MH

References cited:

- Agriculture & Resource Management Council of Australia & New Zealand (ARMCANZ) 2001, *Weeds of National Significance Willow (Salix taxa, excluding S. babylonica, S. x calodendron and S. x reichardtii) Strategic Plan*, National Weeds Strategy Executive Committee, Launceston.
- Bahnzaf R, Kranzle M, Muhle H & Winkler S 1983, ‘Effect of leaf leachates on nitrogen mineralization [German],’ *Verhandlungen der Gesellschaft fur Okologie*, vol. 10, p. 63-70.
- Bailey LH & Bailey LZ 1976 *Hortus Third*, Macmillan, New York & London.
- Besaans (ed.) 1995, *Plant Protection News* vol. 47, pp. 20-24.
- Bokarev KS, Kefeli VI & Kapeljusnikova LM 1966, ‘Chemical and physiological properties of natural inhibitors from *Salix rubra* [Russian],’ *Fizio. Rast.*, Vol. 13(2), p. 274-282.
- Bowen MR & Hoad GV 1968, ‘Inhibitor content of phloem and xylem sap obtained from willow (*Salix viminalis*) entering dormancy,’ *Planta.*, vol 81(1), p. 64-70.
- Carcaillet C, Bergeron Y, Richard PJH, Frechette B, Gauthier S & Prairie YT 2001 ‘Change of fire frequency in the eastern Canadian boreal forests during the Holocene: does vegetation composition or climate trigger the fire regime?’ *Journal of Ecology*, vol. 89, p. 930-946.
- Carr GW 1996, ‘Salix,’ in Walsh NG & Entwistle TJ (Eds.), *Flora of Victoria*, Vol. 3, Inkata Press, Melbourne.
- Carr, GW, Yogovic, JV & Robinson, KE 1992, *Environmental Weed Invasions in Victoria*, Department of Conservation and Environment, Vic.
- Cody WJ 1996, *Flora of the Yukon Territory*, NRC Research Press, Ottawa.
- Cremer KW 1995, *Willow Identification for river management in Australia*, CSIRO Division of Forestry, Orange, NSW.
- Cremer K 1999 *Willow Management for Australian Rivers* CSIRO Forestry and Forest Products, Kingston ACT.
- Cremer, K 2001 *Exterminate Wild Pussy Willows and its most invasive relative,s* CSIRO Forestry and Forest Products, Kingston ACT.
- Cremer K 2003 ‘Introduced willows can become invasive pests in Australia,’ *Biodiversity*, Vol. 4(4), p. 17-24.
- Cremer K, Van Kraayenoord C, Parker N & Streatfield S 1995, ‘Willows spreading by seed,’ *Australian Journal of Soil and Water Conservation*, Vol 8 (4), p. 18-27.
- Crouch RJ & Honeyman MN 1986, ‘The relative slat tolerance of willow cuttings,’ *Journal of Soil Conservation*, vol 42(2), p. 103-104.
- Davis PH 1982, *Flora of Turkey and the east Aegean Islands*, Vol. 7, Edinburgh Uni Press, Edinburgh.
- Davison RM 1965, ‘Some properties of a plant growth inhibitor present in xylem sap of woody species,’ *Australian Journal of Biological Sciences*, vol. 18(3), p. 475-486.

Invasiveness Assessment Record

Scientific name: *Salix alba*

Common Name: white willow

Fircks HA von, Daurin A (ed.), Junttila O (ed.), Nilsen J 1985 'Frost hardiness of fast-growing *Salix* species,' *Plant production in the north. Proceeding from 'Plant adaptation workshop,'* Norway.

Gilliver K 1947, 'The effect of plant extracts on the germination of the conidia of *Venturia inaequalis*,' *Ann. Appl. Biol.*, vol. 34(1), p. 136-143.

Griffiths M 1992, *The New Royal Horticultural Society dictionary of gardening*, vol. 4, Macmillan, London.

Haines A 2004 *Salix myrcoides (bayberry willow) Conservation and Research Plan for New England*, New England Flower Society, Framingham, Massachusetts, USA.

Henderson L 1991 'Alien invasive *Salix* spp. (willows) in the grassland biome of South Africa,' *South African Forestry Journal*, vol. 157, p. 91-95.

Hitchcock CL & Cronquist A 1964, *Vascular Plants of the Pacific Northwest (Part 2)*, University of Washington Press, Seattle & London.

Howard RA 1988, *Flora of the Lesser Antilles*, Vol. 4, Arnold Arboretum, Harvard Uni, Jamaica Plain, Massachusetts.

Holm L et al 1979, *A geographical atlas of world weeds*, Wiley, New York.

Koul VK, Raina A, Dhanna YP, Tickoo ML & Singh 1991, 'Evaluation of allelopathic influence of certain farm grown tree species on rice (*Oryza sativa* L. c.v. PC 19),' *Indian Journal of Forestr*, vol. 14(1), p. 54-57.

Ladson A, Gerrish G, Carr G, Thexton E 1997, *Willows Along Victorian Waterways*, Waterways Unit, Department of Natural Resources and Environment, Vic, Australia.

Maloney RF, Keedwell, RJ, Wells NJ, Reergen AL & Nilsson RG 1999, 'Effect of willow removal on habitat use by five birds of braided rivers, MrKenzie Basin, New Zealand, *New Zealand Journal of Ecology*, Vol. 23, P. 53-60.

Meikle RD 1984, *Willows and Poplars of Great Britain and Ireland*, Botanical Society of the British Isles, London.

Munz PA & Keck DD 1963, *A California Flora*, University of California Press, Berkley & LA.

Newsholme C 1992, *Willows: The genus Salix*, Tumber Press, Portland & Oregon.

Ottenbreit KA & Staniforth JR 1992, 'Life cycle and age structure of ramets in an expanding population of *Salix exigua* (sandbar willow),' *Canadian Journal of Botany*, vol. 70(6), p. 1141-1146.

Purtle C, Stelling F, Martin D, Grossman T, Frankenberg J, Campbell S & Dwyer C 2001a *Willow Identification Guide*, Department of Land and Water Conservation, NSW.

Purtle C, Stelling F, Martin D, Grossman T, Frankenberg J, Campbell S & Dwyer C 2001b *Willows along watercourses: an introduction*, Department of Land and Water Conservation, NSW.

Purtle C, Stelling F, Martin D, Grossman T, Frankenberg J, Campbell S & Dwyer C 2001c Department of Land and Water Conservation, NSW.

Shafroth PB, Scott ML & Friedman JM 1994, 'Establishment, sex structure & breeding system of an exotic riparian willow, *Salix x rubens*,' *American Midland Naturalist*, vol. 132, p. 159-172.

Spencer R 1997, *Horticultural Flora of South-Eastern Australia*, vol. 2, UNSW Press, Australia.

Strutek M, Bauer V, Klimes L & Pinosova J 1988, 'Ecology of economically important plants in the river Luznice floodplain,' *Sbornik Vysoka Skola Zemedelska*, Vol. 5(2), p. 105-118.

Standley PC & Steyermark JA 1958, *Flora of Guatemala*, Vol. 24, *Chicago Natural History Museum*, USA.

Swift CE 1997, *Colorado State University Cooperative Extension*, Colorado State University, viewed: 15/02/2006, www.colostate.edu/Depts/CoopExt/TRA/PLANTS/stable.html.

Tutin TG 1993, *Flora Europaea*, University Press, Cambridge.

Uchytel, RJ 1989, Fire Effects Information System, U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory, viewed: 10/01/2000, <http://www.fs.fed.us/database/feis/plants/tree/salex/all.html>.

Voss EG 1972, *Michigan Flora: A guide to the identification and occurrence of the native and naturalized seed plants of the state*, Crabrook Institute of Science, University of Michigan Herbarium, Michigan.

Walters SM et al (eds) 1989, *The European Garden Flora*, Cambridge University Press, UK.

Invasiveness Assessment Record

Scientific name: *Salix alba*

Common Name: white willow

Webb, Sykes & Garnock-Jones, 1988 CJ, Sykes WR, Garnock-Jones PJ 1988, *Flora of New Zealand*, vo.l. 4, Manaaki Whenua Press, NZ

Zallar S nd, *Botanical Characteristics of the Willows*, Soil Conservation Authority, Kew.

S. cinerea, S. fragilis, S. x rubens & S. nigra are identified by Ladson et al as outstandingly invasive because of their biology and ecology, specifically their reproductive ability.

Revisions

Date	Revised by	Revision

Present distribution of *Salix alba* in Victoria

Scientific name: *Salix alba* L.

Common name(s): white willow

Status:

Habitat:

Native to Africa, temperate Asia and Europe. Found along rivers and watercourses. Of all willows, is most tolerant of brackish water. Prefers a damp, heavy soil in open sunny position (Bodkin 1986). Found from sea level to subalpine mountain zones, although most abundant on lowlands.



Potential distribution of *Salix alba* in Victoria

Scientific name: *Salix alba* L.

Common name(s): white willow

Status:

Habitat:

Native to Africa, temperate Asia and Europe. Found along rivers and watercourses. Of all willows, is most tolerant of brackish water. Prefers a damp, heavy soil in open sunny position (Bodkin 1986). Found from sea level to subalpine mountain zones, although most abundant on lowlands.

Potential distribution produced from CLIMATE modelling refined by applying suitable landuse and vegetation type overlays with CMA boundaries

MAP OVERLAYS USED.

Land Use:

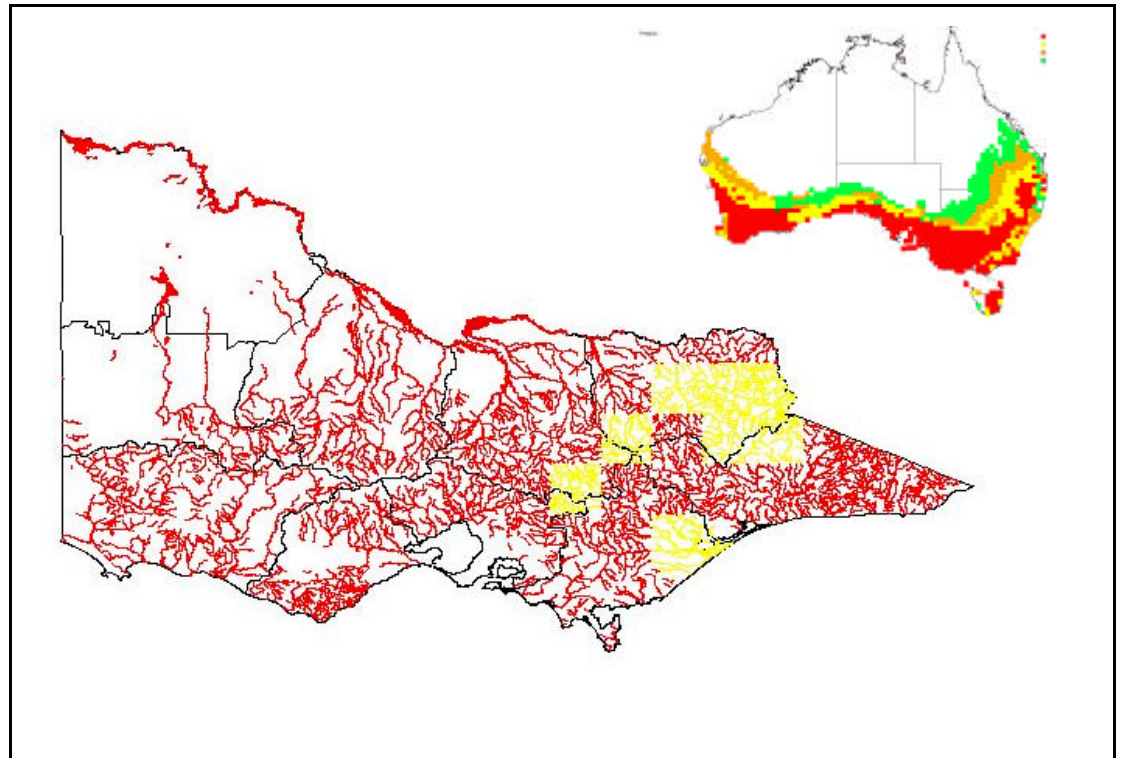
Broad vegetation types

Swamp scrub; riverine grassy woodland; riparian forest

Colours indicate possibility of *Salix alba* infesting these areas.

Red	= Very high	Yellow	= High
Orange	= Medium	Green	= Likely

In the non-coloured areas the plant is unlikely to establish as the climate, soil or landuse is not presently suitable.



Impact Assessment Record

Scientific Name: *Salix alba*

Common name: white willow

QUESTION	COMMENTS	RATING	CONFIDENCE
Social			
1. Restrict human access?	<i>S. alba</i> is able to grow in streambeds (Cremer, 1995), enabling it to block the passage of boats.	H	MH
2. Reduce tourism?	<i>S. alba</i> is able to grow in streambeds (Cremer, 1995), enabling it to block the passage of boats.	H	MH
3. Injurious to people?	No reference to human injury found in any reference. Toxicity rated as 'none' for the species summarised in the USDA Plants Database (2006) including <i>S. purpurea</i> , <i>S. exigua</i> , <i>S. nigra</i> , <i>S. x sepulcralis</i> , <i>S. alba</i> . Presume no toxicity for any <i>Salix</i> .	L	MH
4. Damage to cultural sites?	As semi-aquatic species, confined to stream banks or beds or moist locations (Carr, 1996; Carr et al, 1992; Cody, 1996; Davis, 1982; Howard, 1988; Ladson et al, 1997; Maloney et al, 1999; Munz, 1963; Voss, 1972; Webb, Sykes & Garnock-Jones, 1988) willows are unlikely to grow near enough to cause structural or visual damage to cultural sites. However, during floods, senescent trees can drop large branches or trunks into waterways and a build up of material behind these snags can destroy bridges (ARMCANZ, 2001). Major damage to buildings can occur when streams change route because they have become clogged with mats of willow roots. A Tasmanian Landcare group was formed in response to flooded homes, the cause of which was attributed to stream blockages by willow roots encroaching into streams (Sarah Holland-Clift pers. comm.).	H	MH
Abiotic			
5. Impact flow?	Species such as <i>S. alba</i> that are able to grow in streambeds (Cremer, 1995) can have serious impacts both to surface and subsurface water flow.	H	MH
6. Impact water quality?	As deciduous plants (Carr, 1996), all shrub and tree willows have mass autumn leaf fall, which leads to decreased oxygen levels (Ladson et al, 1997). Intense shading by willows, which tend to have more dense canopies than native species decreases water temperature (Ladson et al, 1997).	H	MH
7. Increase soil erosion?	"Willows encroaching into the centre of streams interrupt the flow of water which results in stream flows being directed into watercourse banks, causing erosion. In severe cases, willows can create complete blockages, causing the stream to change course (Purtle, 2001b). <i>S. alba</i> is capable of encroaching into streams (Cremer, 1995).	H	MH

Impact Assessment Record

Scientific Name: *Salix alba*

Common name: white willow

QUESTION	COMMENTS	RATING	CONFIDENCE
8. Reduce biomass?	As woody plants that can form dense thickets, or large shrubs or trees (Carr, 1996), willows are capable of increasing biomass where they replace lower or less dense vegetation as they commonly do in disturbed sites (Cremer, 1999).	L	MH
9. Change fire regime?	Willows are low flammable/combustible trees (Carcaillet et al, 2001), likely to greatly change the frequency and intensity of fire risk.	H	H
Community Habitat			
10. Impact on composition (a) high value EVC	Basin=Snowy River- Brodnibb River (ISC=excellent); CMA=East Gippsland; CLIMATE=VH. For willow species in general, their “dense shade and mat-forming willow roots suppress and kill indigenous understorey” (Purtle et al, 2001b). Displaces all species within a layer.	H	MH
(b) medium value EVC	All Victorian water bodies considered to comprise high value EVCs only (Weiss pers. coms.).	L	H
(c) low value EVC	All Victorian water bodies considered to comprise high value EVCs only (Weiss pers. coms.).	L	H
11. Impact on structure?	For willows in general, their “dense shade and mat-forming willow roots suppress and kill indigenous understorey” (Purtle et al, 2001b).	MH	MH
12. Effect on threatened flora?	No information found.	MH	L
Fauna			
13. Effect on threatened fauna?	No information found.	MH	L
14. Effect on non-threatened fauna?	Intense shading decreases primary production in waterways, impacting on invertebrates and fish (Ladson et al, 1997). Reduce indigenous vegetation which would otherwise provide habitat (especially tree hollows) and pollen and nectar food sources (Ladson, 1997) “Dense shade and mat-forming willow roots suppress and kill indigenous understorey [which is] important habitat for insects, birds and mammals. Bare banks beneath willows provide little protection for frogs, water rats, snakes, lizards and other fauna. Willows do not provide nectar for native birds...Willows also have few hollows, important habitat for over half of our woodland birds and mammals” (Purtle et al, 2001b). Reduction in habitat for fauna, leading to reduction in numbers of individuals but not to local extinction.	MH	MH

Impact Assessment Record

Scientific Name: *Salix alba*

Common name: white willow

QUESTION	COMMENTS	RATING	CONFIDENCE
15. Benefits fauna?	Possums graze and defoliate isolated trees (ARMCANZ, 2001). <i>S. exigua</i> “stands provide excellent cover for numerous wildlife species” in America (FEIS, 2000). Other thicket-forming species that might also provide habitat include: <i>S. cinerea</i> (Cremer, 2001), <i>S. fragilis</i> (Cremer, 1995), <i>S. purpurea</i> (Cremer, 1999) <i>S. x rubens</i> (Cremer, 1995), <i>S. viminalis</i> (Webb et al, 1988). Willows are capable at most of providing some assistance as either food or shelter to desirable species.	MH	MH
16. Injurious to fauna?	No reference to animal injury found in any reference.	L	H
Pest Animal			
17. Food source to pests?	Possums graze and defoliate isolated trees (ARMCANZ, 2001). Rodents eat the buds and bark of <i>S. nigra</i> (Uchytel, 1989). (Palatable species may provide food for browsing animals. Palatable species include: <i>S. alba</i> & <i>S. exigua</i> , (USDA, 2006) & <i>S. babylonica</i> (Henderson, 1995).	ML	MH
18. Provides harbor?	<i>S. alba</i> generally don't form thickets (Cremer, 1995), making them less likely to harbor vermin.	L	MH
Agriculture			
	Species present as agricultural weeds: <i>S. alba</i> in NZ and USA, <i>S. babylonica</i> and <i>S. cinerea</i> in NZ, <i>S. exigua</i> in USA, <i>S. nigra</i> in USA and <i>S. fragilis</i> is a principal agricultural weed in NZ (Holm et al, 1979). As willows are associated with waterways and not recorded as invaders of pasture or crops, their ability to form dense thickets that impede access to waterways for irrigation is likely to be the only impact they have on agriculture. Willow root mats reduce access to flowing water for irrigation purposes (Sarah Holland-Clift pers. comm.). Thicket-forming and instream species which may reduce access to waterways for irrigation include: <i>S. cinerea</i> (Cremer, 2001), <i>S. exigua</i> (Hitchcock and Cronquist, 1964), <i>S. fragilis</i> (Cremer, 1995), <i>S. purpurea</i> (Cremer, 1999) <i>S. x rubens</i> (Cremer, 1995), <i>S. viminalis</i> (Webb et al, 1988), <i>S. fragilis</i> and <i>S. x rubens</i> (Webb, Sykes & Garnock-Jones, 1998), <i>S. alba</i> (Cremer, 1995), and <i>S. nigra</i> (Cremer, 1999). They are likely to have a minor impact on the quantity of produce.	ML	MH

Impact Assessment Record

Scientific Name: *Salix alba*

Common name: white willow

QUESTION	COMMENTS	RATING	CONFIDENCE
20. Impact quality?	Generally willows are valued for shade and browsing for livestock (Besaans, 1995).	L	H
21. Affect land value?	Whilst risk of floods and erosion (see Q. 7) may cause decrease in land value in some incidences, with a state wide view, this is likely to be negligible.	L	MH
22. Change land use?	Willows are associated with waterways and not recorded as invaders of pasture or crops in the extensive literature. Whilst control may be required (see Q. 23) there is little risk that land use would need to change as a consequence of their invasion of agricultural land.	L	MH
23. Increase harvest costs?	Some willow control to maintain waterways for irrigation may increase harvest costs by a minor amount. This is likely to be for the thicket-forming species: <i>S. cinerea</i> (Cremer, 2001), <i>S. exigua</i> (Hitchcock and Cronquist, 1964), <i>S. fragilis</i> (Cremer, 1995), <i>S. purpurea</i> (Cremer, 1999) <i>S. x rubens</i> (Cremer, 1995), <i>S. viminalis</i> (Webb et al, 1988) and those able to grow instream: <i>S. alba</i> (Cremer, 1995), and <i>S. nigra</i> (Cremer, 1999), <i>S. fragilis</i> and <i>S. x rubens</i> (Webb, Sykes & Garnock-Jones, 1988). In the Jerilderie area 80% of farmers are donating a rebate to fund a project manager for willows in Yanco Creek, because their root mats reduce access to creek water for irrigation (Sarah Holland-Clift).	MH	MH
24. Disease host/vector?	Not found in the extensive literature.	L	H

References cited:

Agriculture & Resource Management Council of Australia & New Zealand (ARMCANZ) 2001, *Weeds of National Significance Willow (Salix taxa, excluding S. babylonica, S. x calodendron and S. x reichardtii) Strategic Plan*, National Weeds Strategy Executive Committee, Launceston.

Aiken SG, Dallwitz MJ, Consaul LL, McJannet CL, Gillespie LJ, Boles RL, Argus GW, Gillett JM, Scott PJ, Elven R, LeBlanc MC, Brysting AK & Solstad H 1999, *Flora of the Canadian Arctic Archipelago: Descriptions, Illustration, Identification, and Information Retrieval*, Memorial University of Newfoundland, viewed: 16/02/2006, www.mun.ca/biology/delta/acrticf/_ca/www/wl.htm.

Bailey LH & Bailey LZ 1976 *Hortus Third*, Macmillan, New York & London.

Besaans (ed.) 1995, *Plant Protection News* vol. 47, pp. 20-24.

Carcaillet C, Bergeron Y, Richard PJH, Frechette B, Gauthier S & Prairie YT 2001 'Change of fire frequency in the eastern Canadian boreal forests during the Holocene: does vegetation composition or climate trigger the fire regime?' *Journal of Ecology*, vol. 89, p. 930-946.

Carr GW 1996, 'Salix,' in Walsh NG & Entwisle TJ (Eds.), *Flora of Victoria*, Vol. 3, Inkata Press, Melbourne.

Carr, GW, Yogovic, JV & Robinson, KE 1992, *Environmental Weed Invasions in Victoria*, Department of Conservation and Environment, Vic.

Cody WJ 1996, *Flora of the Yukon Territory*, NRC Research Press, Ottawa.

Cremer KW 1995, *Willow Identification for river management in Australia*, CSIRO Division of Forestry, Orange, NSW.

Cremer K 1999 *Willow Management for Australian Rivers* CSIRO Forestry and Forest Products, Kingston ACT.

Cremer, K 2001 *Exterminate Wild Pussy Willows and its most invasive relative,s* CSIRO Forestry and Forest Products, Kingston ACT.

Crouch RJ & Honeyman MN 1986, 'The relative salt tolerance of willow cuttings,' *Journal of Soil Conservation*, vol 42(2), p. 103-104.

Davis PH 1982, *Flora of Turkey and the east Aegean Islands*, Vol. 7, Edinburgh Uni Press, Edinburgh.

Impact Assessment Record

Scientific Name: *Salix alba*

Common name: white willow

- Fircks HA von, Daurin A (ed.), Junttila O (ed.), Nilsen J 1985 'Frost hardiness of fast-growing *Salix* species,' *Plant production in the north. Proceeding from 'Plant adaptation workshop,'* Norway.
- Haines A 2004 *Salix myricoides* (bayberry willow) *Conservation and Research Plan for New England*, New England Flower Society, Framingham, Massachusetts, USA.
- Henderson L 1991 'Alien invasive *Salix* spp. (willows) in the grassland biome of South Africa,' *South African Forestry Journal*, vol. 157, p. 91-95.
- Hitchcock CL & Cronquist A 1964, *Vascular Plants of the Pacific Northwest (Part 2)*, University of Washington Press, Seattle & London.
- Howard RA 1988, *Flora of the Lesser Antilles*, Vol. 4, Arnold Arboretum, Harvard Uni, Jamaica Plain, Massachusetts.
- Holm L et al 1979, *A geographical atlas of world weeds*, Wiley, New York.
- Kennedy SA, Ganf FF & Walker KF 2003, 'Does salinity influence the distribution of exotic willows (*Salix* spp.) along the Lower River Murray?' *Marine and Freshwater Research*, vol 54, p. 825-831.
- Ladson A, Gerrish G, Carr G, Thexton E 1997, *Willows Along Victorian Waterways*, Waterways Unit, Department of Natural Resources and Environment, Vic, Australia.
- Maloney RF, Keedwell, RJ, Wells NJ, Reergen AL & Nilsson RG 1999, 'Effect of willow removal on habitat use by five birds of braided rivers, MrKenzie Basin, New Zealand, *New Zealand Journal of Ecology*, Vol. 23, P. 53-60.
- Meikle RD 1984, *Willows and Poplars of Great Britain and Ireland*, Botanical Society of the British Isles, London.
- Munz PA & Keck DD 1963, *A California Flora*, University of California Press, Berkeley & LA.
- Muyt A 2001, *Bush invaders of South-East Australia*, RG and FJ Richardson, Meredith, Vic.
- Newsholme C 1992, *Willows: The genus Salix*, Tumber Press, Portland & Oregon.
- Purtle C, Stelling F, Martin D, Grossman T, Frankenberg J, Campbell S & Dwyer C 2001a *Willow Identification Guide*, Department of Land and Water Conservation,
- Purtle C, Stelling F, Martin D, Grossman T, Frankenberg J, Campbell S & Dwyer C 2001b *Willows along watercourses: an introduction*, Department of Land and Water Conservation,
- Purtle C, Stelling F, Martin D, Grossman T, Frankenberg J, Campbell S & Dwyer C 2001c Department of Land and Water Conservation,
- Shafroth PB, Scott ML & Friedman JM 1994, 'Establishment, sex structure & breeding system of an exotic riparian willow, *Salix x rubens*,' *American Midland Naturalist*, vol. 132, p. 159-172.
- Srutek M, Bauer V, Klimes L & Pinosova J 1988, 'Ecology of economically important plants in the river Luznice floodplain,' *Sbornik Vysoka Skola Zemedelska*, Vol. 5(2), p. 105-118.
- Standley PC & Steyermark JA 1958, *Flora of Guatemala*, Vol. 24, Chicago Natural History Museum, USA.
- Swift CE 1997, *Colorado State University Cooperative Extension*, Colorado State University, viewed: 15/02/2006, www.colostate.edu/Depts/CoopExt/TRA/PLANTS/stable.html.
- Uchytel, RJ 1989, Fire Effects Information System, U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory, viewed: 16/02/2006, www.fs.fed.us/database/feis/plants/tree/salnig/all.html.
- United States Department of Agriculture (USDA) 2006 USDA Plants Database, Washington, viewed: 16/02/2006, http://plants.nrcs.usda.gov/cgi_bin/topics.cgi?earl=characteristics.html.
- Voss EG 1972, *Michigan Flora: A guide to the identification and occurrence of the native and naturalized seed plants of the state*, Crabbrook Institute of Science, University of Michigan Herbarium, Michigan.
- Walters SM et al (eds) 1989, *The European Garden Flora*, Cambridge University Press, UK.
- Webb CJ, Sykes WR, Garnock-Jones PJ 1988, *Flora of New Zealand*, vol. 4, Manaaki Whenua Press, NZ

Impact Assessment Record

Scientific Name: *Salix alba*

Common name: white willow

Zallar S nd, *Botanical Characteristics of the Willows*, Soil Conservation Authority, Kew.

Revisions

Date	Revised by	Revision

Invasiveness Assessment Record

Scientific name: *Salix cinerea*

Common Name: grey willow

QUESTION	COMMENTS	RATING	CONFIDENCE
Establishment			
1. Germination requirements?	<i>S. cinerea</i> spreads by seed to riparian as well as other moist to wet habitats, and this is of special concern.” (Cremer, 1999). This species does not need uncommon natural events for germination.	MH	MH
2. Establishment requirements?	<i>S. cinerea</i> “can invade undisturbed herbaceous wetlands...[and establish] even under dense wet sclerophyll forest” (Cremer, 1999).	H	MH
3. How much disturbance is required?	<i>S. cinerea</i> is “invasive in both disturbed and undisturbed situations” (Carr, 1996) “Can invade undisturbed herbaceous wetlands...even under dense wet sclerophyll forest [and] has invaded steeply sloping, mature pine forest, not just along water courses” (Cremer, 1999).	H	MH
Growth/Competitive			
4. Life form?	Semi-aquatic- All willows are described as growing on the banks of water courses or in moist locations and <i>S. cinerea</i> can also establish on drier soil (Cremer, 1999). <i>S. cinerea</i> grows in swamps, riverbanks, wet areas behind coastal dunes (Webb, Sykes & Garnock-Jones, 1988). “Occurs along streams or near seasonal to permanent swamps and bogs, from sea-level to above the treeline, invasive in both disturbed and undisturbed situations” (Carr, 1996). Invades riparian vegetation, and seasonal and permanent freshwater wetland, alpine and subalpine vegetation (Carr et al, 1992). “Can invade undisturbed herbaceous wetlands...even under dense wet sclerophyll forest...Has invaded steeply sloping, mature pine forest, not just along water courses [and can] establish in undisturbed herbaceous communities above the tree line in National Parks” (Cremer, 1999). “In the Australian Alps...following disturbance by cattle in alpine and subalpine bogs” (Ladson et al, 1997).	H	MH
5. Allelopathic properties?	Of the naturalised willows in Australia, allelopathic compounds have been demonstrated in <i>S. rubra</i> (Bokarev, Kefeli & Kapeljusnikova, 1966), <i>S. babylonica</i> (Koul et al, 1991), <i>S. fragilis</i> (Davison, 1965), <i>S. viminalis</i> (Bowen & Hoad, 1968), <i>S. alba</i> (Banzhaf et al, 1983) and <i>S. purpurea</i> (Gilliver, 1947). For other willow species , their “dense shade and mat-forming willow roots suppress and kill indigenous understorey” (Purtle et al, 2001b), suggesting that there might be an allelopathic basis for this lack of understorey beneath willow infestations, however no specific reference to <i>S. cinerea</i> .	M	L
6. Tolerates herb pressure?	Some <i>Salix</i> species provide good fodder for both ruminants and horses...particularly in Australia (Newsholme, 1992). However, many species tolerate this grazing and/or are able to resprout from stump, eg. <i>S. cinerea</i> (Cremer, 1999).	MH	MH
7. Normal growth rate?	“ <i>Salix</i> are fast growing trees or shrubs, rarely prostrate” (Spencer, 1997). Where growth rates are described, tree and shrub forms of <i>Salix</i> are recorded as vigorous or fast growing, eg. <i>S. alba</i> (Spencer, 1997), <i>S. glaucophylloides</i> (Newsholme, 1992), <i>S. nigra</i> (Cremer, 1995), <i>S. purpurea</i> (Webb, Sykes & Garnock-Jones, 1988) and <i>S. x rubens</i> (Meikle).	H	MH

Invasiveness Assessment Record

Scientific name: *Salix cinerea*

Common Name: grey willow

QUESTION	COMMENTS	RATING	CONFIDENCE
8. Stress tolerance to frost, drought, w/logg, sal. etc?	FIRE “If a tree is completely girdled by fire at ground level it may die without coppicing...however young trees tend to sprout from the buried portion of their stem” (Cremer, 1999), indicating some fire tolerance in tree and shrub willows in general. FROST All tree and shrub species (except <i>S. humboldtiana</i>) in this study are recorded as tolerating USDA hardiness zones of between 1 and 6 (average minimum temperatures between –46C and –17C) (Bailey & Bailey, 1976, Griffiths, 1992). <i>S. humboldtiana</i> is susceptible to frost (Newsholme, 1992). DROUGHT All willows are described as growing on the banks or in the riverbeds of water courses or in moist locations (Carr, 1996; Carr et. al, 1992; Cody, 1996; Davis, 1982; Howard, 1988; Ladson, et al, 1997; Maloney et al, 1999; Munz, 1963; Voss, 1972; Webb, Sykes & Garnock-Jones, 1988) suggesting a low drought tolerance; and only few species (<i>S. cinerea</i> and <i>S. exigua</i>) can also establish on drier soil (but are not necessarily drought tolerant), with <i>S. purpurea</i> alone tolerating extremely dry, sandy soils (Newsholme, 1992). WATERLOGGING Those species able to grow in riverbeds must have high tolerance of waterlogging (<i>S. exigua</i>, Cody, 1996; <i>S. fragilis</i>, Maloney et al, 1999; <i>S. alba</i>, <i>S.x rubens</i>, and <i>S. viminalis</i>; Webb, Sykes & Garnock-Jones, 1988) and also <i>S. cinerea</i> (Cremer, 1999). SALINITY <i>S. alba</i> is “the most tolerant of all willows to brackish water” (Zallar). <i>S. cinerea</i> “tolerates salt-laden air” (Newsholme, 1992), <i>S. fragilis</i>, <i>S. matsudana</i> & <i>S. seringeana</i> tolerate high levels of salinity (Crouch & Honeyman, 1986). <i>S. nigra</i> has moderately high tolerance of salt (Swift, 1997) and <i>S. purpurea</i> shows “considerable tolerance for salt water” (Newsholme, 1992). <i>S. cinerea</i> is highly tolerant of waterlogging, salinity and frost, has some tolerance of fire, but not of drought.	MH	MH
Reproduction			
9. Reproductive system	<i>S. cinerea</i> reproduction is largely by seed (Carr, 1996). “Probably does not sucker and rarely breaks off live branches. Layering is rare until the trees are old and fall over” (Cremer, 1999). Capable of reproducing both vegetatively and by seed.	H	MH
10. Number of propagules produced?	“A large crown would produce over 500 000 seeds (Cremer, 1999). Seeds numerous, very small, each with a tuft of long hairs (Tutin, 1993).	H	MH
11. Propagule longevity?	“Willow seed is very short-lived” with longer-lived species recorded at surviving 8-10 weeks (Cremer, 1999).	L	MH
12. Reproductive period?	Following reproductive maturity “flowering tends to be ample and to occur every year” (Cremer, 1999). <i>S. cinerea</i> “stands are mostly monoculture excluding 97% of sunlight and most other species” (Cremer, 1999). The oldest stem <i>S. exigua</i> in this study was 31 years (Ottenbreit & Staniforth, 1992). An old <i>S. fragilis</i> tree was observed to 130 years (Meikle, 1984).	H	MH

Invasiveness Assessment Record

Scientific name: *Salix cinerea*

Common Name: grey willow

QUESTION	COMMENTS	RATING	CONFIDENCE
13. Time to reproductive maturity?	“Flowering and the production of viable seed may begin two to three years after germination, provided the plant is at least 1m tall if it is a shrub willow, or 2m tall if it is a tree willow...In some taxa (eg. <i>S. alba</i>) flowering tends to begin at larger sizes” (Cremer, 1999), which is probably still within 5 years. For plants that have reproduced vegetatively, this may be reduced, as in <i>S. nigra</i>, observed flowering on cuttings produced from < 1 year old growth (Crouch & Honeyman, 1986).	ML	MH
Dispersal			
14. Number of mechanisms?	Vegetative propagules and seed spread by water. “Seed is easily carried by wind” (Cremer, 1999).	H	MH
15. How far do they disperse?	“Seed is easily carried by wind for more than 1km and some travels for up to 50km or even 100km (Cremer, 1999) for species that commonly reproduce by seed: <i>S. cinerea</i> , <i>S. nigra</i> , <i>S. purpurea</i> , <i>S. aegyptica</i> , <i>S. glaucophylloides</i> , & <i>S. viminalis</i> (ARMCANZ, 2001).	H	MH

References cited:

- Agriculture & Resource Management Council of Australia & New Zealand (ARMCANZ) 2001, *Weeds of National Significance Willow (Salix taxa, excluding S. babylonica, S. x calodendron and S. x reichardtii) Strategic Plan*, National Weeds Strategy Executive Committee, Launceston.
- Bahnzaf R, Kranzle M, Muhle H & Winkler S 1983, ‘Effect of leaf leachates on nitrogen mineralization [German],’ *Verhandlungen der Gesellschaft fur Okologie*, vol. 10, p. 63-70.
- Bailey LH & Bailey LZ 1976 *Hortus Third*, Macmillan, New York & London.
- Besaans (ed.) 1995, *Plant Protection News* vol. 47, pp. 20-24.
- Bokarev KS, Kefeli VI & Kapeljusnikova LM 1966, ‘Chemical and physiological properties of natural inhibitors from *Salix rubra* [Russian],’ *Fizio. Rast.*, Vol. 13(2), p. 274-282.
- Bowen MR & Hoad GV 1968, ‘Inhibitor content of phloem and xylem sap obtained from willow (*Salix viminalis*) entering dormancy,’ *Planta.*, vol 81(1), p. 64-70.
- Carcaillet C, Bergeron Y, Richard PJH, Frechette B, Gauthier S & Prairie YT 2001 ‘Change of fire frequency in the eastern Canadian boreal forests during the Holocene: does vegetation composition or climate trigger the fire regime?’ *Journal of Ecology*, vol. 89, p. 930-946.
- Carr GW 1996, ‘Salix,’ in Walsh NG & Entwisle TJ (Eds.), *Flora of Victoria*, Vol. 3, Inkata Press, Melbourne.
- Carr, GW, Yogovic, JV & Robinson, KE 1992, *Environmental Weed Invasions in Victoria*, Department of Conservation and Environment, Vic.
- Cody WJ 1996, *Flora of the Yukon Territory*, NRC Research Press, Ottawa.
- Cremer KW 1995, *Willow Identification for river management in Australia*, CSIRO Division of Forestry, Orange, NSW.
- Cremer K 1999 *Willow Management for Australian Rivers* CSIRO Forestry and Forest Products, Kingston ACT.
- Cremer, K 2001 *Exterminate Wild Pussy Willows and its most invasive relative,s* CSIRO Forestry and Forest Products, Kingston ACT.
- Cremer K 2003 ‘Introduced willows can become invasive pests in Australia,’ *Biodiversity*, Vol. 4(4), p. 17-24.
- Cremer K, Van Kraayenoord C, Parker N & Streatfield S 1995, ‘Willows spreading by seed,’ *Australian Journal of Soil and Water Conservation*, Vol 8 (4), p. 18-27.
- Crouch RJ & Honeyman MN 1986, ‘The relative slat tolerance of willow cuttings,’ *Journal of Soil Conservation*, vol 42(2), p. 103-104.
- Davis PH 1982, *Flora of Turkey and the east Aegean Islands*, Vol. 7, Edinburgh Uni Press, Edinburgh.
- Davison RM 1965, ‘Some properties of a plant growth inhibitor present in xylem sap of woody species,’ *Australian Journal of Biological Sciences*, vol. 18(3), p. 475-486.

Invasiveness Assessment Record

Scientific name: *Salix cinerea*

Common Name: grey willow

Fircks HA von, Daurin A (ed.), Junttila O (ed.), Nilsen J 1985 'Frost hardiness of fast-growing *Salix* species,' *Plant production in the north. Proceeding from 'Plant adaptation workshop,'* Norway.

Gilliver K 1947, 'The effect of plant extracts on the germination of the conidia of *Venturia inaequalis*,' *Ann. Appl. Biol.*, vol. 34(1), p. 136-143.

Griffiths M 1992, *The New Royal Horticultural Society dictionary of gardening*, vol. 4, Macmillan, London.

Haines A 2004 *Salix myrcoides (bayberry willow) Conservation and Research Plan for New England*, New England Flower Society, Framingham, Massachusetts, USA.

Henderson L 1991 'Alien invasive *Salix* spp. (willows) in the grassland biome of South Africa,' *South African Forestry Journal*, vol. 157, p. 91-95.

Hitchcock CL & Cronquist A 1964, *Vascular Plants of the Pacific Northwest (Part 2)*, University of Washington Press, Seattle & London.

Howard RA 1988, *Flora of the Lesser Antilles*, Vol. 4, Arnold Arboretum, Harvard Uni, Jamaica Plain, Massachusetts.

Holm L et al 1979, *A geographical atlas of world weeds*, Wiley, New York.

Koul VK, Raina A, Dhanna YP, Tickoo ML & Singh 1991, 'Evaluation of allelopathic influence of certain farm grown tree species on rice (*Oryza sativa* L. c.v. PC 19),' *Indian Journal of Forestr*, vol. 14(1), p. 54-57.

Ladson A, Gerrish G, Carr G, Thexton E 1997, *Willows Along Victorian Waterways*, Waterways Unit, Department of Natural Resources and Environment, Vic, Australia.

Maloney RF, Keedwell, RJ, Wells NJ, Reergen AL & Nilsson RG 1999, 'Effect of willow removal on habitat use by five birds of braided rivers, MrKenzie Basin, New Zealand, *New Zealand Journal of Ecology*, Vol. 23, P. 53-60.

Meikle RD 1984, *Willows and Poplars of Great Britain and Ireland*, Botanical Society of the British Isles, London.

Munz PA & Keck DD 1963, *A California Flora*, University of California Press, Berkley & LA.

Newsholme C 1992, *Willows: The genus Salix*, Tumber Press, Portland & Oregon.

Ottenbreit KA & Staniforth JR 1992, 'Life cycle and age structure of ramets in an expanding population of *Salix exigua* (sandbar willow),' *Canadian Journal of Botany*, vol. 70(6), p. 1141-1146.

Purtle C, Stelling F, Martin D, Grossman T, Frankenberg J, Campbell S & Dwyer C 2001a *Willow Identification Guide*, Department of Land and Water Conservation, NSW.

Purtle C, Stelling F, Martin D, Grossman T, Frankenberg J, Campbell S & Dwyer C 2001b *Willows along watercourses: an introduction*, Department of Land and Water Conservation, NSW.

Purtle C, Stelling F, Martin D, Grossman T, Frankenberg J, Campbell S & Dwyer C 2001c Department of Land and Water Conservation, NSW.

Shafroth PB, Scott ML & Friedman JM 1994, 'Establishment, sex structure & breeding system of an exotic riparian willow, *Salix x rubens*,' *American Midland Naturalist*, vol. 132, p. 159-172.

Spencer R 1997, *Horticultural Flora of South-Eastern Australia*, vol. 2, UNSW Press, Australia.

Strutek M, Bauer V, Klimes L & Pinosova J 1988, 'Ecology of economically important plants in the river Luznice floodplain,' *Sbornik Vysoka Skola Zemedelska*, Vol. 5(2), p. 105-118.

Standley PC & Steyermark JA 1958, *Flora of Guatemala*, Vol. 24, *Chicago Natural History Museum*, USA.

Swift CE 1997, *Colorado State University Cooperative Extension*, Colorado State University, viewed: 15/02/2006, www.colostate.edu/Depts/CoopExt/TRA/PLANTS/stable.html.

Tutin TG 1993, *Flora Europaea*, University Press, Cambridge.

Uchytel, RJ 1989, Fire Effects Information System, U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory, viewed: 10/01/2000, <http://www.fs.fed.us/database/feis/plants/tree/salex/all.html>.

Voss EG 1972, *Michigan Flora: A guide to the identification and occurrence of the native and naturalized seed plants of the state*, Crabrook Institute of Science, University of Michigan Herbarium, Michigan.

Walters SM et al (eds) 1989, *The European Garden Flora*, Cambridge University Press, UK.

Invasiveness Assessment Record

Scientific name: *Salix cinerea*

Common Name: grey willow

Webb, Sykes & Garnock-Jones, 1988 CJ, Sykes WR, Garnock-Jones PJ 1988, *Flora of New Zealand*, vo.l. 4, Manaaki Whenua Press, NZ

Zallar S nd, *Botanical Characteristics of the Willows*, Soil Conservation Authority, Kew.

S. cinerea, S. fragilis, S. x rubens & S. nigra are identified by Ladson et al as outstandingly invasive because of their biology and ecology, specifically their reproductive ability.

Revisions

Date

Revised by

Revision

Present distribution of *Salix cinerea* in Victoria

Scientific name: *Salix cinerea* L.

Common name(s): grey sallow

Status:

Habitat:

Native of Europe and West Asia. In Australia, readily invades wet or moist habitats well beyond open riparian sites. In lowland and mountain streams in both disturbed and undisturbed situations. Occurs extensively in permanent creeks even under fairly dense wet sclerophyll forests (Cremer 1999). Prefers a damp, heavy soil and can tolerate acidity. Extends to boggy and intermittently moist sites, from sea level to above alpine tree level (Cremer 2001).



Potential distribution of *Salix cinerea* in Victoria

Scientific name: *Salix cinerea* L.

Common name(s): grey sallow

Status:

Habitat:

Native of Europe and West Asia. In Australia, readily invades wet or moist habitats well beyond open riparian sites. In lowland and mountain streams in both disturbed and undisturbed situations. Occurs extensively in permanent creeks even under fairly dense wet sclerophyll forests (Cremer 1999). Prefers a damp, heavy soil and can tolerate acidity. Extends to boggy and intermittently moist sites, from sea level to above alpine tree level (Cremer 2001).

Potential distribution produced from CLIMATE modelling refined by applying suitable landuse and vegetation type overlays with CMA boundaries

MAP OVERLAYS USED.

Land Use:

Irrigated pasture

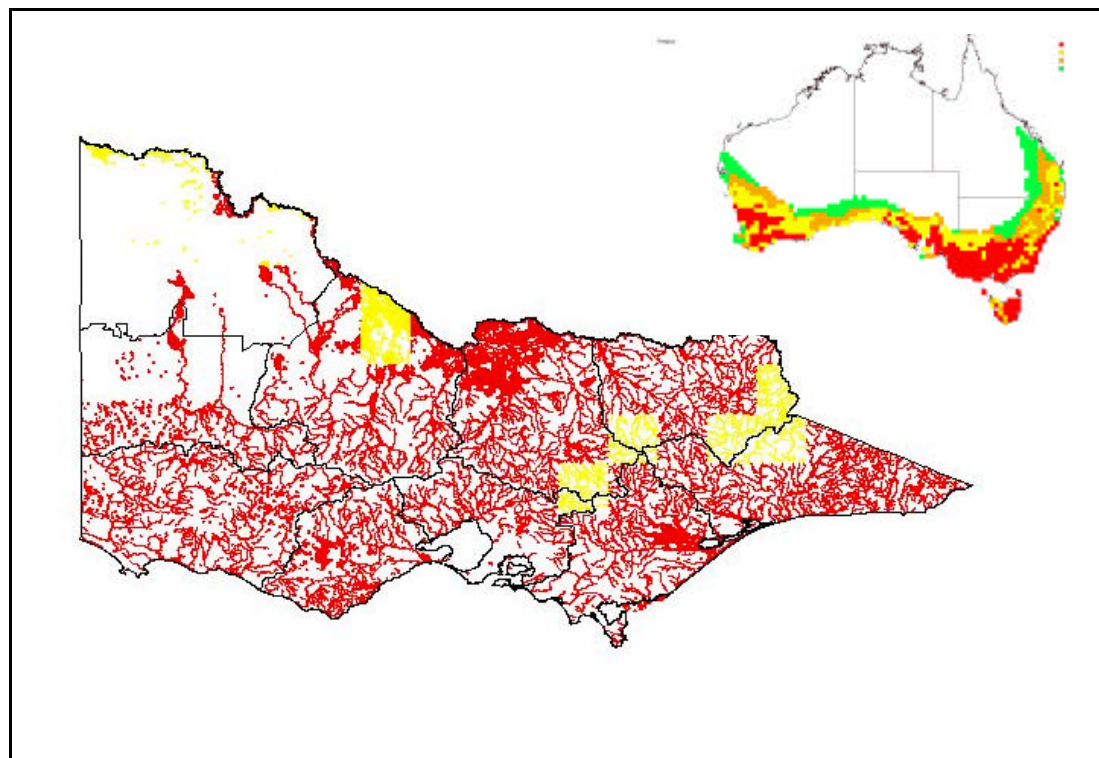
Broad vegetation types

Swamp scrub; riverine grassy woodland; riparian forest

Colours indicate possibility of *Salix cinerea* infesting these areas.

Red	= Very high	Yellow	= High
Orange	= Medium	Green	= Likely

In the non-coloured areas the plant is unlikely to establish as the climate, soil or landuse is not presently suitable.



Impact Assessment Record

Scientific Name: *Salix cinerea*

Common name: grey willow

QUESTION	COMMENTS	RATING	CONFIDENCE
Social			
1. Restrict human access?	Willows can form dense thickets several metres thick, with densely spaced stems (FEIS, 2000) that could be major impediments to access waterways. <i>S. cinerea</i> "is a multistemmed 'shrub willow.' Their multitudes of stems obstruct floods" (Cremer, 2001).	H	MH
2. Reduce tourism?	<i>S. cinerea</i> is a thicket forming species (see Q. 1) that is especially adapted to waterlogging that may encroach into streams, trapping silt and reducing channel capacity (Purtle et al, 2001b), can create a shallow stream that boats and swimmers can no longer use.	H	MH
3. Injurious to people?	No reference to human injury found in any reference. Toxicity rated as 'none' for the species summarised in the USDA Plants Database (2006) including <i>S. purpurea</i> , <i>S. exigua</i> , <i>S. nigra</i> , <i>S. x sepulcralis</i> , <i>S. alba</i> . Presume no toxicity for any <i>Salix</i> .	L	MH
4. Damage to cultural sites?	As semi-aquatic species, confined to stream banks or beds or moist locations (Carr, 1996; Carr et al, 1992; Cody, 1996; Davis, 1982; Howard, 1988; Ladson et al, 1997; Maloney et al, 1999; Munz, 1963; Voss, 1972; Webb, Sykes & Garnock-Jones, 1988) willows are unlikely to grow near enough to cause structural or visual damage to cultural sites. However, during floods, senescent trees can drop large branches or trunks into waterways and a build up of material behind these snags can destroy bridges (ARMCANZ, 2001). Major damage to buildings can occur when streams change route because they have become clogged with mats of willow roots. A Tasmanian Landcare group was formed in response to flooded homes, the cause of which was attributed to stream blockages by willow roots encroaching into streams (Sarah Holland-Clift pers. comm.).	H	MH
Abiotic			
5. Impact flow?	<i>S. cinerea</i> is a thicket forming species (see Q. 1) that is especially adapted to waterlogging (Cremer, 1999) that may encroach into streams, trapping silt and reducing channel capacity (Purtle et al, 2001b), having a serious impact on both surface and subsurface water flow.	H	MH
6. Impact water quality?	As deciduous plants (Carr, 1996), all shrub and tree willows have mass autumn leaf fall, which leads to decreased oxygen levels (Ladson et al, 1997). Intense shading by willows, which tend to have more dense canopies than native species decreases water temperature (Ladson et al, 1997).	H	MH
7. Increase soil erosion?	"Willows encroaching into the centre of streams interrupt the flow of water which results in stream flows being directed into watercourse banks, causing erosion. In severe cases, willows can create complete blockages, causing the stream to change course (Purtle, 2001b). <i>S. cinerea</i> is capable of encroaching into streams (see Q. 5).	H	MH

Impact Assessment Record

Scientific Name: *Salix cinerea*

Common name: grey willow

QUESTION	COMMENTS	RATING	CONFIDENCE
8. Reduce biomass?	As woody plants that can form dense thickets, or large shrubs or trees (Carr, 1996), willows are capable of increasing biomass where they replace lower or less dense vegetation as they commonly do in disturbed sites (Cremer, 1999).	L	MH
9. Change fire regime?	Willows are low flammable/combustible trees (Carcaillet et al, 2001), likely to greatly change the frequency and intensity of fire risk.	H	H
Community Habitat			
10. Impact on composition (a) high value EVC	Basin=Snowy River- Brodnibb River (ISC=excellent); CMA=East Gippsland; CLIMATE=VH. "Stands are mostly monocultures excluding 97% of sunlight and most other species (Cremer, 1999). Capable of forming monocultures displacing all species within a layer	H	MH
(b) medium value EVC	All Victorian waterbodies are assumed to be high value EVCs.	L	H
(c) low value EVC	All Victorian waterbodies are assumed to be high value EVCs.	L	H
11. Impact on structure?	<i>S. cinerea</i> is spreading, often forming dense thickets. Often forms dominant vegetation in swampy habitats (Webb, Sykes & Garnock-Jones, 1988). "Stands are mostly monocultures excluding 97% of sunlight and most other species (Cremer, 1999). Capable of having the same major effect on all layers of native vegetation.	H	MH
12. Effect on threatened flora?	"The sedge-rich <i>Eucalyptus camphora</i> Swamp Community, a dominant swamp vegetation of the Reserve, is also listed under the <i>Flora and Fauna Guarantee Act</i> 1988. This community type is very rare...one species is of state significance and 55 are of regional significance. Willows could easily overtop [<i>E. camphora</i>] and prevent its recruitment...The most serious willow [at this site] is <i>S. cinerea</i> " (Ladson et al 1997).	H	MH
Fauna			
13. Effect on threatened fauna?	In Yellingbo State Fauna Reserve "willow species have the potential to seriously degrade, or even destroy in the longer-term, the habitat of the...highly localised, endemic, endangered...Helmeted honeyeater and the...endangered...Leadbeaters Possum which are dependent on riparian vegetation for their survival. <i>Eucalyptus camphora</i> , which provides nectar in winter, is the principal habitat component for the Helmeted honeyeater and willows could easily overtop this small tree and prevent its recruitment. The most serious willow [at this site] is <i>S. cinerea</i> " (Ladson et al 1997). <i>S. cinerea</i> seriously threatens the nationally significant alpine bogs and fens in Victoria (eg. Bogong High Plains) and the Red Gum floodplain vegetation in the Lower Ovens Heritage River (ARMCANZ, 2001). All willows are capable of invading riparian zones and reducing the habitat available to vertebrates. For example, the rare Broad-toothed Rat that that favours drainage-line vegetation (Ladson et al, 1997).	H	MH
14. Effect on non-threatened fauna?	Intense shading decreases primary production in waterways, impacting on invertebrates and fish (Ladson et al, 1997). Reduce indigenous vegetation which would otherwise provide habitat (especially tree hollows) and pollen	MH	MH

Impact Assessment Record

Scientific Name: *Salix cinerea*

Common name: grey willow

QUESTION	COMMENTS	RATING	CONFIDENCE
	and nectar food sources (Ladson, 1997) “Dense shade and mat-forming willow roots suppress and kill indigenous understorey [which is] important habitat for insects, birds and mammals. Bare banks beneath willows provide little protection for frogs, water rats, snakes, lizards and other fauna. Willows do not provide nectar for native birds...Willows also have few hollows, important habitat for over half of our woodland birds and mammals” (Purtle et al, 2001b). Reduction in habitat for fauna, leading to reduction in numbers of individuals but not to local extinction.		
15. Benefits fauna?	Possums graze and defoliate isolated trees (ARMCANZ, 2001). <i>S. exigua</i> “stands provide excellent cover for numerous wildlife species” in America (FEIS, 2000). Other thicket-forming species that might also provide habitat include: <i>S. cinerea</i> (Cremer, 2001), <i>S. fragilis</i> (Cremer, 1995), <i>S. purpurea</i> (Cremer, 1999) <i>S. x rubens</i> (Cremer, 1995), <i>S. viminalis</i> (Webb et al, 1988). Willows are capable at most of providing some assistance as either food or shelter to desirable species.	MH	MH
16. Injurious to fauna?	No reference to animal injury found in any reference.	L	H
Pest Animal			
17. Food source to pests?	The palatability of other species is unknown.	M	L
18. Provides harbor?	<i>S. exigua</i> “stands provide excellent cover for numerous wildlife species” (FEIS, 2000). Other thicket-forming species that might harbour foxes and rabbits include: <i>S. cinerea</i> (Cremer, 2001), <i>S. fragilis</i> (Cremer, 1995), <i>S. purpurea</i> (Cremer, 1999), <i>S. x rubens</i> (Cremer, 1995), <i>S. viminalis</i> (Webb et al, 1988).	H	MH
Agriculture			
19. Impact yield?	Species present as agricultural weeds: <i>S. alba</i> in NZ and USA, <i>S. babylonica</i> and <i>S. cinerea</i> in NZ, <i>S. exigua</i> in USA, <i>S. nigra</i> in USA and <i>S. fragilis</i> is a principal agricultural weed in NZ (Holm et al, 1979). As willows are associated with waterways and not recorded as invaders of pasture or crops, their ability to form dense thickets that impede access to waterways for irrigation is likely to be the only impact they have on agriculture. Willow root mats reduce access to flowing water for irrigation purposes (Sarah Holland-Clift pers. comm.).	ML	MH

Impact Assessment Record

Scientific Name: *Salix cinerea*

Common name: grey willow

QUESTION	COMMENTS	RATING	CONFIDENCE
20. Impact quality?	Generally willows are valued for shade and browsing for livestock (Besaans, 1995).	L	MH
21. Affect land value?	Whilst risk of floods and erosion may cause decrease in land value in some incidences, with a state wide view, this is likely to be negligible.	L	MH
22. Change land use?	Willows are associated with waterways and not recorded as invaders of pasture or crops in the extensive literature. Whilst control may be required (see Q. 23) there is little risk that land use would need to change as a consequence of their invasion of agricultural land.	L	MH
23. Increase harvest costs?	Some willow control to maintain waterways for irrigation may increase harvest costs by a minor amount. This is likely to be for the thicket-forming species such as <i>S. cinerea</i> (Cremer, 2001). In the Jerilderie area 80% of farmers are donating a rebate to fund a project manager for willows in Yanco Creek, because their root mats reduce access to creek water for irrigation (Sarah Holland-Clift).	MH	MH
24. Disease host/vector?	Not found in the extensive literature.	L	H

References cited:

- Agriculture & Resource Management Council of Australia & New Zealand (ARMCANZ) 2001, *Weeds of National Significance Willow (Salix taxa, excluding S. babylonica, S. x calodendron and S. x reichardtii) Strategic Plan*, National Weeds Strategy Executive Committee, Launceston.
- Aiken SG, Dallwitz MJ, Consaul LL, McJannet CL, Gillespie LJ, Boles RL, Argus GW, Gillett JM, Scott PJ, Elven R, LeBlanc MC, Brysting AK & Solstad H 1999, *Flora of the Canadian Arctic Archipelago: Descriptions, Illustration, Identification, and Information Retrieval*, Memorial University of Newfoundland, viewed: 16/02/2006, www.mun.ca/biology/delta/arctic/_ca/ www.wl.htm.
- Bailey LH & Bailey LZ 1976 *Hortus Third*, Macmillan, New York & London.
- Besaans (ed.) 1995, *Plant Protection News* vol. 47, pp. 20-24.
- Carcaillet C, Bergeron Y, Richard PJH, Frechette B, Gauthier S & Prairie YT 2001 'Change of fire frequency in the eastern Canadian boreal forests during the Holocene: does vegetation composition or climate trigger the fire regime?' *Journal of Ecology*, vol. 89, p. 930-946.
- Carr GW 1996, 'Salix,' in Walsh NG & Entwistle TJ (Eds.), *Flora of Victoria*, Vol. 3, Inkata Press, Melbourne.
- Carr, GW, Yogovic, JV & Robinson, KE 1992, *Environmental Weed Invasions in Victoria*, Department of Conservation and Environment, Vic.
- Cody WJ 1996, *Flora of the Yukon Territory*, NRC Research Press, Ottawa.
- Cremer KW 1995, *Willow Identification for river management in Australia*, CSIRO Division of Forestry, Orange, NSW.
- Cremer K 1999 *Willow Management for Australian Rivers* CSIRO Forestry and Forest Products, Kingston ACT.
- Cremer, K 2001 *Exterminate Wild Pussy Willows and its most invasive relative,s* CSIRO Forestry and Forest Products, Kingston ACT.
- Crouch RJ & Honeyman MN 1986, 'The relative salt tolerance of willow cuttings,' *Journal of Soil Conservation*, vol 42(2), p. 103-104.
- Davis PH 1982, *Flora of Turkey and the east Aegean Islands*, Vol. 7, Edinburgh Uni Press, Edinburgh.

Impact Assessment Record

Scientific Name: *Salix cinerea*

Common name: grey willow

- Fircks HA von, Daurin A (ed.), Junttila O (ed.), Nilsen J 1985 'Frost hardiness of fast-growing *Salix* species,' *Plant production in the north. Proceeding from 'Plant adaptation workshop,'* Norway.
- Haines A 2004 *Salix myricoides* (bayberry willow) *Conservation and Research Plan for New England*, New England Flower Society, Framingham, Massachusetts, USA.
- Henderson L 1991 'Alien invasive *Salix* spp. (willows) in the grassland biome of South Africa,' *South African Forestry Journal*, vol. 157, p. 91-95.
- Hitchcock CL & Cronquist A 1964, *Vascular Plants of the Pacific Northwest (Part 2)*, University of Washington Press, Seattle & London.
- Howard RA 1988, *Flora of the Lesser Antilles*, Vol. 4, Arnold Arboretum, Harvard Uni, Jamaica Plain, Massachusetts.
- Holm L et al 1979, *A geographical atlas of world weeds*, Wiley, New York.
- Kennedy SA, Ganf FF & Walker KF 2003, 'Does salinity influence the distribution of exotic willows (*Salix* spp.) along the Lower River Murray?' *Marine and Freshwater Research*, vol 54, p. 825-831.
- Ladson A, Gerrish G, Carr G, Thexton E 1997, *Willows Along Victorian Waterways*, Waterways Unit, Department of Natural Resources and Environment, Vic, Australia.
- Maloney RF, Keedwell, RJ, Wells NJ, Reergen AL & Nilsson RG 1999, 'Effect of willow removal on habitat use by five birds of braided rivers, McKenzie Basin, New Zealand,' *New Zealand Journal of Ecology*, Vol. 23, P. 53-60.
- Meikle RD 1984, *Willows and Poplars of Great Britain and Ireland*, Botanical Society of the British Isles, London.
- Munz PA & Keck DD 1963, *A California Flora*, University of California Press, Berkeley & LA.
- Muyt A 2001, *Bush invaders of South-East Australia*, RG and FJ Richardson, Meredith, Vic.
- Newsholme C 1992, *Willows: The genus Salix*, Timber Press, Portland & Oregon.
- Purtle C, Stelling F, Martin D, Grossman T, Frankenberg J, Campbell S & Dwyer C 2001a *Willow Identification Guide*, Department of Land and Water Conservation,
- Purtle C, Stelling F, Martin D, Grossman T, Frankenberg J, Campbell S & Dwyer C 2001b *Willows along watercourses: an introduction*, Department of Land and Water Conservation,
- Purtle C, Stelling F, Martin D, Grossman T, Frankenberg J, Campbell S & Dwyer C 2001c Department of Land and Water Conservation,
- Shafroth PB, Scott ML & Friedman JM 1994, 'Establishment, sex structure & breeding system of an exotic riparian willow, *Salix x rubens*,' *American Midland Naturalist*, vol. 132, p. 159-172.
- Srutek M, Bauer V, Klimes L & Pinosova J 1988, 'Ecology of economically important plants in the river Luznice floodplain,' *Sbornik Vysoka Skola Zemedelska*, Vol. 5(2), p. 105-118.
- Standley PC & Steyermark JA 1958, *Flora of Guatemala*, Vol. 24, Chicago Natural History Museum, USA.
- Swift CE 1997, *Colorado State University Cooperative Extension*, Colorado State University, viewed: 15/02/2006, www.colostate.edu/Depts/CoopExt/TRA/PLANTS/stable.html.
- Uchytel, RJ 1989, Fire Effects Information System, U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory, viewed: 16/02/2006, www.fs.fed.us/database/feis/plants/tree/salnig/all.html.
- United States Department of Agriculture (USDA) 2006 USDA Plants Database, Washington, viewed: 16/02/2006, http://plants.nrcs.usda.gov/cgi_bin/topics.cgi?earl=characteristics.html.
- Voss EG 1972, *Michigan Flora: A guide to the identification and occurrence of the native and naturalized seed plants of the state*, Crabbrook Institute of Science, University of Michigan Herbarium, Michigan.

Impact Assessment Record

Scientific Name: *Salix cinerea*

Common name: grey willow

Walters SM et al (eds) 1989, *The European Garden Flora*, Cambridge University Press, UK.

Webb CJ, Sykes WR, Garnock-Jones PJ 1988, *Flora of New Zealand*, vol. 4, Manaaki Whenua Press, NZ

Zaller S nd, *Botanical Characteristics of the Willows*, Soil Conservation Authority, Kew.

Revisions

Date	Revised by	Revision

Invasiveness Assessment Record

Scientific name: *Salix fragilis*

Common Name: Willows

QUESTION	COMMENTS	RATING	CONFIDENCE
Establishment			
1. Germination requirements?	“The ‘fragility’...of willows varies greatly and this is the single most important attribute conferring invasibility...by vegetative means.” The most fragile taxa include: <i>Salix fragilis</i> , <i>S. x rubens</i> , <i>S. x pendulina</i> , <i>S. alba</i> , <i>S. x sepulcralis</i> , and <i>S. matsudana</i> ‘ <i>Torulosa</i> ’. They take root where they lodge in water or on wet ground (Ladson et al, 1997)ie. opportunistic species.	H	MH
2. Establishment requirements?	Willows are described as heliophyllic (intolerant of shade) (Haines, 2004) and most species ...must not be overhung by larger plants or trees (Newsholme, 1992).	ML	MH
3. How much disturbance is required?	<i>S. fragilis</i> establish predominantly vegetatively (Ladson et al, 1997) and so tend to “invade riverbanks, lakesides, drainage channels, swaps, almost all wet places (Webb, Sykes & Garnock-Jones, 1988) that are, by their nature, disturbed ecosystems.	MH	MH
Growth/Competitive			
4. Life form?	Semi-aquatic- All willows are described as growing on the banks of water courses or in moist locations, with some able to grow in riverbeds. <i>S. fragilis</i> grows in waterways, ponds, lakesides and other wet habitats (Webb, Sykes & Garnock-Jones, 1988), streambanks (Carr, 1996), riverbeds (Maloney et al, 1999).	H	MH
5. Allelopathic properties?	Of the naturalised willows in Australia, allelopathic compounds have been demonstrated in <i>S. rubra</i> (Bokarev, Kefeli & Kapeljusnikova, 1966), <i>S. babylonica</i> (Koul et al, 1991), <i>S. fragilis</i> (Davison, 1965), <i>S. viminalis</i> (Bowen & Hoad, 1968), <i>S. alba</i> (Banzhaf et al, 1983) and <i>S. purpurea</i> (Gilliver, 1947).	MH	H
6. Tolerates herb pressure?	No information	M	L
7. Normal growth rate?	“ <i>Salix</i> are fast growing trees or shrubs, rarely prostrate” (Spencer, 1997). Where growth rates are described, tree and shrub forms of <i>Salix</i> are recorded as vigorous or fast growing, eg. <i>S. alba</i> (Spencer, 1997), <i>S. glaucophylloides</i> (Newsholme, 1992), <i>S. nigra</i> (Cremer, 1995), <i>S. purpurea</i> (Webb, Sykes & Garnock-Jones, 1988) and <i>S. x rubens</i> (Meikle).	H	MH

Invasiveness Assessment Record

Scientific name: *Salix fragilis*

Common Name: Willows

QUESTION	COMMENTS	RATING	CONFIDENCE
8. Stress tolerance to frost, drought, w/logg, sal. etc?	FIRE “If a tree is completely girdled by fire at ground level it may die without coppicing...however young trees tend to sprout from the buried portion of their stem” (Cremer, 1999), indicating some fire tolerance in tree and shrub willows in general. FROST All tree and shrub species (except <i>S. humboldtiana</i>) in this study are recorded as tolerating USDA hardiness zones of between 1 and 6 (average minimum temperatures between –46C and –17C) (Bailey & Bailey, 1976, Griffiths, 1992). <i>S. humboldtiana</i> is susceptible to frost (Newsholme, 1992). DROUGHT All willows are described as growing on the banks or in the riverbeds of water courses or in moist locations (Carr, 1996; Carr et. al, 1992; Cody, 1996; Davis, 1982; Howard, 1988; Ladson, et al, 1997; Maloney et al, 1999; Munz, 1963; Voss, 1972; Webb, Sykes & Garnock-Jones, 1988) suggesting a low drought tolerance; and only few species (<i>S. cinerea</i> and <i>S. exigua</i>) can also establish on drier soil (but are not necessarily drought tolerant), with <i>S. purpurea</i> alone tolerating extremely dry, sandy soils (Newsholme, 1992). WATERLOGGING Those species able to grow in riverbeds must have high tolerance of waterlogging (<i>S. exigua</i>, Cody, 1996; <i>S. fragilis</i>, Maloney et al, 1999; <i>S. alba</i>, <i>S.x rubens</i>, and <i>S. viminalis</i>; Webb, Sykes & Garnock-Jones, 1988) and also <i>S. cinerea</i> (Cremer, 1999). SALINITY <i>S. alba</i> is “the most tolerant of all willows to brackish water” (Zallar). <i>S. cinerea</i> “tolerates salt-laden air” (Newsholme, 1992), <i>S. fragilis</i>, <i>S. matsudana</i> & <i>S. seringeana</i> tolerate high levels of salinity (Crouch & Honeyman, 1986). <i>S. nigra</i> has moderately high tolerance of salt (Swift, 1997) and <i>S. purpurea</i> shows “considerable tolerance for salt water” (Newsholme, 1992). <i>S. fragilis</i> are highly tolerant of waterlogging, salinity and frost, have some tolerance of fire, but not of drought	MH	MH
Reproduction			
9. Reproductive system	Salicacea are dioecious (Tutin, 1993). <i>S. aegyptica</i> may produce male and female catkins (Tutin, 1993). There are only male <i>S. fragilis</i> in Australia (ARMCANZ, 2001), so whilst these species can cross pollinate other willows, they produce no seed of their own and only propagate vegetatively (Newsholme, 1992).	MH	MH
10. Number of propagules produced?	See Q. 9. No seed produced.	L	MH
11. Propagule longevity?	See Q. 9. No seed produced.	L	MH
12. Reproductive period?	Following reproductive maturity “flowering tends to be ample and to occur every year” (Cremer, 1999). <i>S. cinerea</i> “stands are mostly monoculture excluding 97% of sunlight and most other species” (Cremer, 1999). The oldest stem <i>S. exigua</i> in this study was 31 years (Ottenbreit & Staniforth, 1992). An old <i>S. fragilis</i> tree was observed to 130 years (Meikle, 1984).	H	MH

Invasiveness Assessment Record

Scientific name: *Salix fragilis*

Common Name: Willows

QUESTION	COMMENTS	RATING	CONFIDENCE
13. Time to reproductive maturity?	See Q. 9. No seed produced.	M	MH
Dispersal			
14. Number of mechanisms?	For male <i>S. fragilis</i> , which only reproduce vegetatively (ARMCANZ, 2001), propagules only spread by water.	MH	MH
15. How far do they disperse?	In species where vegetative reproduction predominates, such as <i>S. fragilis</i> (ARMCANZ, 2001), <i>S. x rubens</i> provides evidence that “very few individuals observed long distances from existing mature trees and these were downstream of cities, towns and homesteads” (Shafroth et al, 1994).	MH	MH

References cited:

- Agriculture & Resource Management Council of Australia & New Zealand (ARMCANZ) 2001, *Weeds of National Significance Willow (Salix taxa, excluding S. babylonica, S. x calodendron and S. x reichardtii) Strategic Plan*, National Weeds Strategy Executive Committee, Launceston.
- Bahnzaf R, Kranzle M, Muhle H & Winkler S 1983, ‘Effect of leaf leachates on nitrogen mineralization [German],’ *Verhandlungen der Gesellschaft fur Okologie*, vol. 10, p. 63-70.
- Bailey LH & Bailey LZ 1976 *Hortus Third*, Macmillan, New York & London.
- Besaans (ed.) 1995, *Plant Protection News* vol. 47, pp. 20-24.
- Bokarev KS, Kefeli VI & Kapeljusnikova LM 1966, ‘Chemical and physiological properties of natural inhibitors from *Salix rubra* [Russian],’ *Fizio. Rast.*, Vol. 13(2), p. 274-282.
- Bowen MR & Hoad GV 1968, ‘Inhibitor content of phloem and xylem sap obtained from willow (*Salix viminalis*) entering dormancy,’ *Planta.*, vol 81(1), p. 64-70.
- Carcaillet C, Bergeron Y, Richard PJH, Frechette B, Gauthier S & Prairie YT 2001 ‘Change of fire frequency in the eastern Canadian boreal forests during the Holocene: does vegetation composition or climate trigger the fire regime?’ *Journal of Ecology*, vol. 89, p. 930-946.
- Carr GW 1996, ‘Salix,’ in Walsh NG & Entwisle TJ (Eds.), *Flora of Victoria*, Vol. 3, Inkata Press, Melbourne.
- Carr, GW, Yogovic, JV & Robinson, KE 1992, *Environmental Weed Invasions in Victoria*, Department of Conservation and Environment, Vic.
- Cody WJ 1996, *Flora of the Yukon Territory*, NRC Research Press, Ottawa.
- Cremer KW 1995, *Willow Identification for river management in Australia*, CSIRO Division of Forestry, Orange, NSW.
- Cremer K 1999 *Willow Management for Australian Rivers* CSIRO Forestry and Forest Products, Kingston ACT.
- Cremer, K 2001 *Exterminate Wild Pussy Willows and its most invasive relative,s* CSIRO Forestry and Forest Products, Kingston ACT.
- Cremer K 2003 ‘Introduced willows can become invasive pests in Australia,’ *Biodiversity*, Vol. 4(4), p. 17-24.
- Cremer K, Van Kraayenoord C, Parker N & Streatfield S 1995, ‘Willows spreading by seed,’ *Australian Journal of Soil and Water Conservation*, Vol 8 (4), p. 18-27.
- Crouch RJ & Honeyman MN 1986, ‘The relative slat tolerance of willow cuttings,’ *Journal of Soil Conservation*, vol 42(2), p. 103-104.
- Davis PH 1982, *Flora of Turkey and the east Aegean Islands*, Vol. 7, Edinburgh Uni Press, Edinburgh.
- Davison RM 1965, ‘Some properties of a plant growth inhibitor present in xylem sap of woody species,’ *Australian Journal of Biological Sciences*, vol. 18(3), p. 475-486.

Invasiveness Assessment Record

Scientific name: *Salix fragilis*

Common Name: Willows

Fircks HA von, Daurin A (ed.), Junttila O (ed.), Nilsen J 1985 'Frost hardiness of fast-growing *Salix* species,' *Plant production in the north. Proceeding from 'Plant adaptation workshop,'* Norway.

Gilliver K 1947, 'The effect of plant extracts on the germination of the conidia of *Venturia inaequalis*,' *Ann. Appl. Biol.*, vol. 34(1), p. 136-143.

Griffiths M 1992, *The New Royal Horticultural Society dictionary of gardening*, vol. 4, Macmillan, London.

Haines A 2004 *Salix myrcoides (bayberry willow) Conservation and Research Plan for New England*, New England Flower Society, Framingham, Massachusetts, USA.

Henderson L 1991 'Alien invasive *Salix* spp. (willows) in the grassland biome of South Africa,' *South African Forestry Journal*, vol. 157, p. 91-95.

Hitchcock CL & Cronquist A 1964, *Vascular Plants of the Pacific Northwest (Part 2)*, University of Washington Press, Seattle & London.

Howard RA 1988, *Flora of the Lesser Antilles*, Vol. 4, Arnold Arboretum, Harvard Uni, Jamaica Plain, Massachusetts.

Holm L et al 1979, *A geographical atlas of world weeds*, Wiley, New York.

Koul VK, Raina A, Dhanna YP, Tickoo ML & Singh 1991, 'Evaluation of allelopathic influence of certain farm grown tree species on rice (*Oryza sativa* L. c.v. PC 19),' *Indian Journal of Forestr*, vol. 14(1), p. 54-57.

Ladson A, Gerrish G, Carr G, Thexton E 1997, *Willows Along Victorian Waterways*, Waterways Unit, Department of Natural Resources and Environment, Vic, Australia.

Maloney RF, Keedwell, RJ, Wells NJ, Reergen AL & Nilsson RG 1999, 'Effect of willow removal on habitat use by five birds of braided rivers, MrKenzie Basin, New Zealand, *New Zealand Journal of Ecology*, Vol. 23, P. 53-60.

Meikle RD 1984, *Willows and Poplars of Great Britain and Ireland*, Botanical Society of the British Isles, London.

Munz PA & Keck DD 1963, *A California Flora*, University of California Press, Berkley & LA.

Newsholme C 1992, *Willows: The genus Salix*, Tumber Press, Portland & Oregon.

Ottenbreit KA & Staniforth JR 1992, 'Life cycle and age structure of ramets in an expanding population of *Salix exigua* (sandbar willow),' *Canadian Journal of Botany*, vol. 70(6), p. 1141-1146.

Purtle C, Stelling F, Martin D, Grossman T, Frankenberg J, Campbell S & Dwyer C 2001a *Willow Identification Guide*, Department of Land and Water Conservation, NSW.

Purtle C, Stelling F, Martin D, Grossman T, Frankenberg J, Campbell S & Dwyer C 2001b *Willows along watercourses: an introduction*, Department of Land and Water Conservation, NSW.

Purtle C, Stelling F, Martin D, Grossman T, Frankenberg J, Campbell S & Dwyer C 2001c Department of Land and Water Conservation, NSW.

Shafroth PB, Scott ML & Friedman JM 1994, 'Establishment, sex structure & breeding system of an exotic riparian willow, *Salix x rubens*,' *American Midland Naturalist*, vol. 132, p. 159-172.

Spencer R 1997, *Horticultural Flora of South-Eastern Australia*, vol. 2, UNSW Press, Australia.

Strutek M, Bauer V, Klimes L & Pinosova J 1988, 'Ecology of economically important plants in the river Luznice floodplain,' *Sbornik Vysoka Skola Zemedelska*, Vol. 5(2), p. 105-118.

Standley PC & Steyermark JA 1958, *Flora of Guatemala*, Vol. 24, *Chicago Natural History Museum*, USA.

Swift CE 1997, *Colorado State University Cooperative Extension*, Colorado State University, viewed: 15/02/2006, www.colostate.edu/Depts/CoopExt/TRA/PLANTS/stable.html.

Tutin TG 1993, *Flora Europaea*, University Press, Cambridge.

Uchytel, RJ 1989, Fire Effects Information System, U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory, viewed: 10/01/2000, <http://www.fs.fed.us/database/feis/plants/tree/salex/all.html>.

Voss EG 1972, *Michigan Flora: A guide to the identification and occurrence of the native and naturalized seed plants of the state*, Crabrook Institute of Science, University of Michigan Herbarium, Michigan.

Invasiveness Assessment Record

Scientific name: *Salix fragilis*

Common Name: Willows

Walters SM et al (eds) 1989, *The European Garden Flora*, Cambridge University Press, UK.

Webb, Sykes & Garnock-Jones, 1988 CJ, Sykes WR, Garnock-Jones PJ 1988, *Flora of New Zealand*, vo.l. 4, Manaaki Whenua Press, NZ

Zallar S nd, *Botanical Characteristics of the Willows*, Soil Conservation Authority, Kew.

S. cinerea, S. fragilis, S. x rubens & S. nigra are identified by Ladson et al as outstandingly invasive because of their biology and ecology, specifically their reproductive ability.

Revisions

Date	Revised by	Revision

Present distribution of *Salix fragilis* in Victoria

Scientific name: *Salix fragilis* L.

Common name(s): brittle willow, crack willow

Status:

Habitat:

Native to temperate Asia and Europe. Found in streamsides, marshes, fens and wet woods. Prefers a damp heavy soil in a sunny position (PFAF 2000). In New Zealand, found in rivers and drains. Found in Victoria along Tarwin River (Cremer 1995). Abundant on lowland river banks and gravel beds, but also by streams and rivers in hilly regions.



Potential distribution of *Salix fragilis* in Victoria

Scientific name: *Salix fragilis* L.

Common name(s): brittle willow, crack willow

Status:

Habitat:

Native to temperate Asia and Europe. Found in streamsides, marshes, fens and wet woods. Prefers a damp heavy soil in a sunny position (PFAF 2000). In New Zealand, found in rivers and drains. Found in Victoria along Tarwin River (Cremer 1995). Abundant on lowland river banks and gravel beds, but also by streams and rivers in hilly regions.

Potential distribution produced from CLIMATE modelling refined by applying suitable landuse and vegetation type overlays with CMA boundaries

MAP OVERLAYS USED.

Land Use:

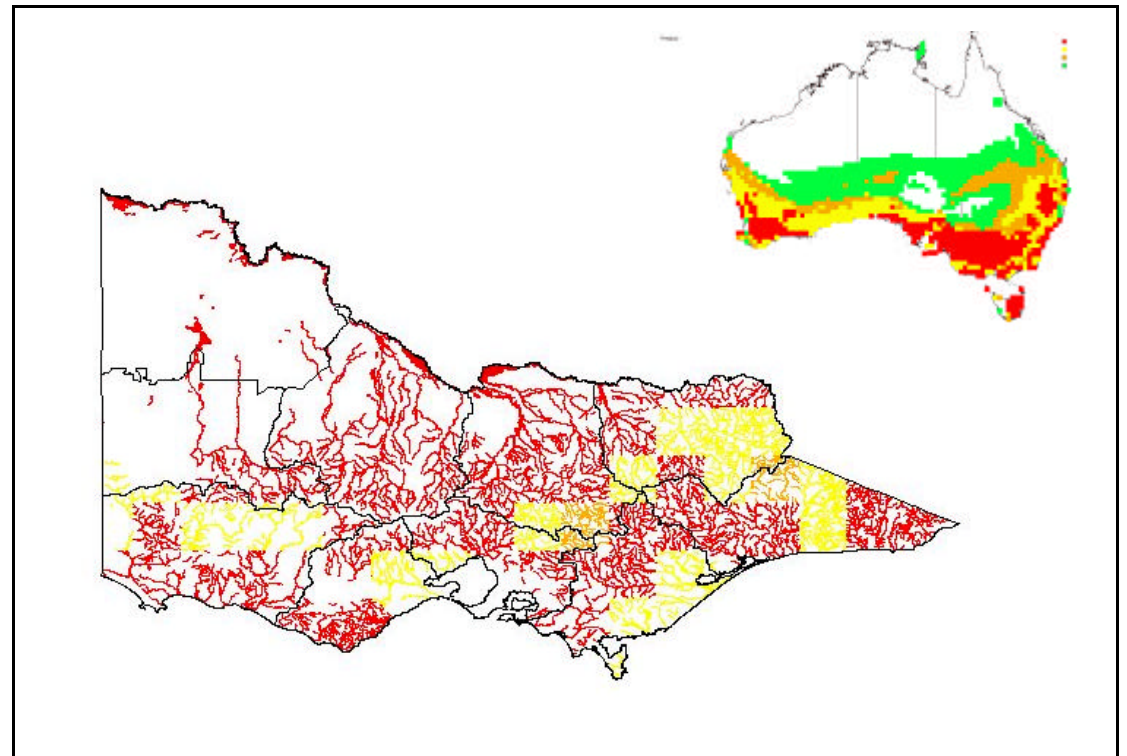
Broad vegetation types

Swamp scrub; riverine grassy woodland; riparian forest

Colours indicate possibility of *Salix fragilis* infesting these areas.

Red	= Very high	Yellow	= High
Orange	= Medium	Green	= Likely

In the non-coloured areas the plant is unlikely to establish as the climate, soil or landuse is not presently suitable.



Impact Assessment Record

Scientific Name: *Salix fragilis*

Common name: Willows

QUESTION	COMMENTS	RATING	CONFIDENCE
Social			
1. Restrict human access?	Willows can form dense thickets several metres thick, with densely spaced stems (FEIS, 2000) that could be major impediments to access waterways. <i>S. fragilis</i> is a thicket-forming species (Cremer, 1995). <i>S. fragilis</i> also have extensive roots, which can grow out into the stream (Cremer, 1995), “trapping silt and layering new roots over the top of the old ones...creating a broad shallow stream” (Muyt, 2001) and “block[s] streams, drains and culverts (Webb, Sykes & Garnock-Jones, 1988). They are a major impediment to access waterways.	H	MH
2. Reduce tourism?	<i>S. fragilis</i> can grow instream and has roots that encroach into streams(Cremer, 1995), trapping silt and reducing channel capacity to create a shallow stream that boats and swimmers can no longer use have block the passage of boats (see Q. 5).	H	MH
3. Injurious to people?	No reference to human injury found in any reference. Toxicity rated as ‘none’ for the species summarised in the USDA Plants Database (2006) including <i>S. purpurea</i> , <i>S. exigua</i> , <i>S. nigra</i> , <i>S. xsepulcralis</i> , <i>S. alba</i> . Presume no toxicity for any <i>Salix</i> .	L	MH
4. Damage to cultural sites?	As semi-aquatic species, confined to stream banks or beds or moist locations (Carr, 1996; Carr et al, 1992; Cody, 1996; Davis, 1982; Howard, 1988; Ladson et al, 1997; Maloney et al, 1999; Munz, 1963; Voss, 1972; Webb, Sykes & Garnock-Jones, 1988) willows are unlikely to grow near enough to cause structural or visual damage to cultural sites. However, during floods, senescent trees can drop large branches or trunks into waterways and a build up of material behind these snags can destroy bridges (ARMCANZ, 2001). Major damage to buildings can occur when streams change route because they have become clogged with mats of willow roots. A Tasmanian Landcare group was formed in response to flooded homes, the cause of which was attributed to stream blockages by willow roots encroaching into streams (Sarah Holland-Clift pers. comm.).	H	MH
Abiotic			
5. Impact flow?	<i>S. fragilis</i> are able to grow in streambeds (Webb, Sykes & Garnock-Jones, 1988) and so can have serious impacts both to surface and subsurface water flow. They can also put roots out into the water (Cremer, 1995), “which can grow out into the stream trapping silt and layering new roots over the top of the old ones...creating a broad shallow stream” (Muyt, 2001) and “can decrease channel capacity, exacerbate flooding and change flood patterns” (Purtle et al, 2001b).	H	MH
6. Impact water quality?	As deciduous plants (Carr, 1996), all shrub and tree willows have mass autumn leaf fall, which leads to decreased oxygen levels (Ladson et al, 1997). Intense shading by willows, which tend to have more dense canopies than native species decreases water temperature (Ladson et al, 1997).	H	MH

Impact Assessment Record

Scientific Name: *Salix fragilis*

Common name: Willows

QUESTION	COMMENTS	RATING	CONFIDENCE
7. Increase soil erosion?	“Willows encroaching into the centre of streams interrupt the flow of water which results in stream flows being directed into watercourse banks, causing erosion. In severe cases, willows can create complete blockages, causing the stream to change course” (Purtle, 2001b). <i>S. fragilis</i> are capable of encroaching into streams (Webb, Sykes & Garnock-Jones, 1988).	H	MH
8. Reduce biomass?	As woody plants that can form dense thickets, or large shrubs or trees (Carr, 1996), willows are capable of increasing biomass where they replace lower or less dense vegetation as they commonly do in disturbed sites (Cremer, 1999).	L	MH
9. Change fire regime?	Willows are low flammable/combustible trees (Carcaillet et al, 2001), likely to greatly change the frequency and intensity of fire risk.	H	H
Community Habitat			
10. Impact on composition (a) high value EVC	Basin = East Gippsland – Cann River (ISC=excellent); CMA = East Gippsland; CLIMATE potential = VH; Several suckering species have been recorded forming dense thickets that exclude sunlight and most other species, including <i>S. cinerea</i> , (Cremer, 1999) and <i>S. fragilis</i> (Henderson, 1991). <i>S. fragilis</i> have formed monotypic stands along kilometres of riverbank (Kennedy, Ganf & Walker, 2003). Potential to form monocultures excluding all other species within a layer.	H	MH
(b) medium value EVC	All Victorian waterbodies are assumed to be high value EVCs.	L	H
(c) low value EVC	All Victorian waterbodies are assumed to be high value EVCs.	L	H
11. Impact on structure?	Several suckering species have been recorded forming dense thickets that exclude sunlight and most other species, including <i>S. cinerea</i> , (Cremer, 1999) and <i>S. fragilis</i> (Henderson, 1991). <i>S. fragilis</i> have formed monotypic stands along kilometres of riverbank (Kennedy, Ganf & Walker, 2003).	H	H
12. Effect on threatened flora?	No information found.	MH	L
Fauna			
13. Effect on threatened fauna?	No information found.	MH	L
14. Effect on non-threatened fauna?	Intense shading decreases primary production in waterways, impacting on invertebrates and fish (Ladson et al, 1997). Reduce indigenous vegetation which would otherwise provide habitat (especially tree hollows) and pollen and nectar food sources (Ladson, 1997) “Dense shade and mat-forming willow roots suppress and kill indigenous understorey [which is] important habitat for insects, birds and mammals. Bare banks beneath willows provide little protection for frogs,	MH	MH

Impact Assessment Record

Scientific Name: *Salix fragilis*

Common name: Willows

QUESTION	COMMENTS	RATING	CONFIDENCE
	water rats, snakes, lizards and other fauna. Willows do not provide nectar for native birds...Willows also have few hollows, important habitat for over half of our woodland birds and mammals" (Purtle et al, 2001b). Reduction in habitat for fauna, leading to reduction in numbers of individuals but not to local extinction.		
15. Benefits fauna?	Possums graze and defoliate isolated trees (ARMCANZ, 2001). <i>S. exigua</i> "stands provide excellent cover for numerous wildlife species" in America (FEIS, 2000). Other thicket-forming species that might also provide habitat include: <i>S. cinerea</i> (Cremer, 2001), <i>S. fragilis</i> (Cremer, 1995), <i>S. purpurea</i> (Cremer, 1999) <i>S. x rubens</i> (Cremer, 1995), <i>S. viminalis</i> (Webb et al, 1988). Willows are capable at most of providing some assistance as either food or shelter to desirable species.	MH	MH
16. Injurious to fauna?	No reference to animal injury found in any reference.	L	H
Pest Animal			
17. Food source to pests?	The palatability of this species is unknown.	M	L
18. Provides harbor?	<i>S. exigua</i> "stands provide excellent cover for numerous wildlife species" (FEIS, 2000). <i>S. fragilis</i> is also a thicket-forming species (Cremer, 1995) that might harbour foxes and rabbits include.	H	MH
Agriculture			
19. Impact yield?	Species present as agricultural weeds: <i>S. alba</i> in NZ and USA, <i>S. babylonica</i> and <i>S. cinerea</i> in NZ, <i>S. exigua</i> in USA, <i>S. nigra</i> in USA and <i>S. fragilis</i> is a principal agricultural weed in NZ (Holm et al, 1979). As willows are associated with waterways and not recorded as invaders of pasture or crops, their ability to form dense thickets that impede access to waterways for irrigation is likely to be the only impact they have on agriculture. Willow root mats reduce access to flowing water for irrigation purposes (Sarah Holland-Clift pers. comm.). <i>S. fragilis</i> (Cremer, 1995) is a thicket-forming and instream species which may reduce access to waterways for irrigation. They are likely to have a minor impact on the quantity of produce.	ML	MH

Impact Assessment Record

Scientific Name: *Salix fragilis*

Common name: Willows

QUESTION	COMMENTS	RATING	CONFIDENCE
20. Impact quality?	Generally willows are valued for shade and browsing for livestock (Besaans, 1995).	L	MH
21. Affect land value?	“Fibrous willow roots and dense willow foliage trap large amounts of silt which can decrease channel capacity, exacerbate flooding and change flood patterns...Willows encroaching into the centre of streams interrupt the flow of water which results in stream flows being directed into watercourse banks, causing erosion.” (Purtle, 2001b). Whilst risk of floods and erosion may cause decrease in land value in some incidences, with a state wide view, this is likely to be negligible.	L	MH
22. Change land use?	Willows are associated with waterways and not recorded as invaders of pasture or crops in the extensive literature. Whilst control may be required (see Q. 23) there is little risk that land use would need to change as a consequence of their invasion of agricultural land.	L	H
23. Increase harvest costs?	Some willow control to maintain waterways for irrigation may increase harvest costs by a minor amount. This is likely to be for the thicket-forming species and those able to grow instream such as <i>S. purpurea</i> (Cremer, 1999). In the Jerilderie area 80% of farmers are donating a rebate to fund a project manager for willows in Yanco Creek, because their root mats reduce access to creek water for irrigation (Sarah Holland-Clift).	MH	MH
24. Disease host/vector?	Not found in the extensive literature.	L	H

References cited:

Agriculture & Resource Management Council of Australia & New Zealand (ARMCANZ) 2001, *Weeds of National Significance Willow (Salix taxa, excluding S. babylonica, S. x calodendron and S. x reichardtii)* Strategic Plan, National Weeds Strategy Executive Committee, Launceston.

Aiken SG, Dallwitz MJ, Consaul LL, McJannet CL, Gillespie LJ, Boles RL, Argus GW, Gillett JM, Scott PJ, Elven R, LeBlanc MC, Brysting AK & Solstad H 1999, *Flora of the Canadian Arctic Archipelago: Descriptions, Illustration, Identification, and Information Retrieval*, Memorial University of Newfoundland, viewed: 16/02/2006, www.mun.ca/biology/delta/acrtict/_ca/www/wl.htm.

Bailey LH & Bailey LZ 1976 *Hortus Third*, Macmillan, New York & London.

Besaans (ed.) 1995, *Plant Protection News* vol. 47, pp. 20-24.

Carcaillet C, Bergeron Y, Richard PJH, Frechette B, Gauthier S & Prairie YT 2001 ‘Change of fire frequency in the eastern Canadian boreal forests during the Holocene: does vegetation composition or climate trigger the fire regime?’ *Journal of Ecology*, vol. 89, p. 930-946.

Carr GW 1996, ‘Salix,’ in Walsh NG & Entwisle TJ (Eds.), *Flora of Victoria*, Vol. 3, Inkata Press, Melbourne.

Carr, GW, Yogovic, JV & Robinson, KE 1992, *Environmental Weed Invasions in Victoria*, Department of Conservation and Environment, Vic.

Cody WJ 1996, *Flora of the Yukon Territory*, NRC Research Press, Ottawa.

Cremer KW 1995, *Willow Identification for river management in Australia*, CSIRO Division of Forestry, Orange, NSW.

Cremer K 1999 *Willow Management for Australian Rivers* CSIRO Forestry and Forest Products, Kingston ACT.

Cremer, K 2001 *Exterminate Wild Pussy Willows and its most invasive relative,s* CSIRO Forestry and Forest Products, Kingston ACT.

Crouch RJ & Honeyman MN 1986, ‘The relative salt tolerance of willow cuttings,’ *Journal of Soil Conservation*, vol 42(2), p. 103-104.

Impact Assessment Record

Scientific Name: *Salix fragilis*

Common name: Willows

- Davis PH 1982, *Flora of Turkey and the east Aegean Islands*, Vol. 7, Edinburgh Uni Press, Edinburgh.
- Fircks HA von, Daurin A (ed.), Junttila O (ed.), Nilsen J 1985 'Frost hardiness of fast-growing *Salix* species,' *Plant production in the north. Proceeding from 'Plant adaptation workshop*, ' Norway.
- Haines A 2004 *Salix myrcoides (bayberry willow) Conservation and Research Plan for New England*, New England Flower Society, Framingham, Massachusetts, USA.
- Henderson L 1991 'Alien invasive *Salix* spp. (willows) in the grassland biome of South Africa,' *South African Forestry Journal*, vol. 157, p. 91-95.
- Hitchcock CL & Cronquist A 1964, *Vascular Plants of the Pacific Northwest (Part 2)*, University of Washington Press, Seattle & London.
- Howard RA 1988, *Flora of the Lesser Antilles*, Vol. 4, Arnold Arboretum, Harvard Uni, Jamaica Plain, Massachusetts.
- Holm L et al 1979, *A geographical atlas of world weeds*, Wiley, New York.
- Kennedy SA, Ganf FF & Walker KF 2003, 'Does salinity influence the distribution of exotic willows (*Salix* spp.) along the Lower River Murray?' *Marine and Freshwater Research*, vol 54, p. 825-831.
- Ladson A, Gerrish G, Carr G, Thexton E 1997, *Willows Along Victorian Waterways*, Waterways Unit, Department of Natural Resources and Environment, Vic, Australia.
- Maloney RF, Keedwell, RJ, Wells NJ, Reergen AL & Nilsson RG 1999, 'Effect of willow removal on habitat use by five birds of braided rivers, MrKenzie Basin, New Zealand, *New Zealand Journal of Ecology*, Vol. 23, P. 53-60.
- Meikle RD 1984, *Willows and Poplars of Great Britain and Ireland*, Botanical Society of the British Isles, London.
- Munz PA & Keck DD 1963, *A California Flora*, University of California Press, Berkley & LA.
- Muyt A 2001, *Bush invaders of South-East Australia*, RG and FJ Richardson, Meredith, Vic.
- Newsholme C 1992, *Willows: The genus Salix*, Tumber Press, Portland & Oregon.
- Purtle C, Stelling F, Martin D, Grossman T, Frankenberg J, Campbell S & Dwyer C 2001a *Willow Identification Guide*, Department of Land and Water Conservation,
- Purtle C, Stelling F, Martin D, Grossman T, Frankenberg J, Campbell S & Dwyer C 2001b *Willows along watercourses: an introduction*, Department of Land and Water Conservation,
- Purtle C, Stelling F, Martin D, Grossman T, Frankenberg J, Campbell S & Dwyer C 2001c Department of Land and Water Conservation,
- Shafroth PB, Scott ML & Friedman JM 1994, 'Establishment, sex structure & breeding system of an exotic riparian willow, *Salix x rubens*,' *American Midland Naturalist*, vol. 132, p. 159-172.
- Srutek M, Bauer V, Klimes L & Pinosova J 1988, 'Ecology of economically important plants in the river Luznice floodplain,' *Sbornik Vysoka Skola Zemedelska*, Vol. 5(2), p. 105-118.
- Standley PC & Steyermark JA 1958, *Flora of Guatemala*, Vol. 24, Chicago Natural History Museum, USA.
- Swift CE 1997, *Colorado State University Cooperative Extension*, Colorado State University, viewed: 15/02/2006, www.colostate.edu/Depts/CoopExt/TRA/PLANTS/stable.html.
- Uchytel, RJ 1989, Fire Effects Information System, U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory, viewed: 16/02/2006, www.fs.fed.us/database/feis/plants/tree/salnig/all.html.
- United States Department of Agriculture (USDA) 2006 USDA Plants Database, Washington, viewed: 16/02/2006, http://plants.nrcs.usda.gov/cgi_bin/topics.cgi?earl=characteristics.html.
- Voss EG 1972, *Michigan Flora: A guide to the identification and occurrence of the native and naturalized seed plants of the state*, Crabbrook Institute of Science, University of Michigan Herbarium, Michigan.
- Walters SM et al (eds) 1989, *The European Garden Flora*, Cambridge University Press, UK.

Impact Assessment Record

Scientific Name: *Salix fragilis*

Common name: Willows

Webb CJ, Sykes WR, Garnock-Jones PJ 1988, *Flora of New Zealand*, vol. 4, Manaaki Whenua Press, NZ
Zallar S nd, *Botanical Characteristics of the Willows*, Soil Conservation Authority, Kew.

Revisions

Date	Revised by	Revision

Invasiveness Assessment Record

Scientific name: *Salix humboldtiana*

Common Name: Willows

QUESTION	COMMENTS	RATING	CONFIDENCE
Establishment			
1. Germination requirements?	<i>S. humboldtiana</i> reproduce vegetatively (Newsholme, 1992). They take root where they lodge in water or on wet ground (Ladson et al, 1997). i.e. opportunistic species.	H	MH
2. Establishment requirements?	Willows are described as heliophyllic (intolerant of shade) (Haines, 2004) and most species ...must not be overhung by larger plants or trees (Newsholme, 1992).	ML	MH
3. How much disturbance is required?	<i>S. humboldtiana</i> establish vegetatively (Newsholme, 1992), and as such, tending to “invade riverbanks, lakesides, drainage channels, swaps, almost all wet places (Webb, Sykes & Garnock-Jones, 1988) that are, by their nature, disturbed ecosystems.	MH	MH
Growth/Competitive			
4. Life form?	Semi-aquatic- All willows are described as growing on the banks of water courses or in moist locations. <i>S. humboldtiana</i> grows on banks of watercourses or in moist locations (Howard, 1988).	H	MH
5. Allelopathic properties?	Of the naturalised willows in Australia, allelopathic compounds have been demonstrated in <i>S. rubra</i> (Bokarev, Kefeli & Kapeljusnikova, 1966), <i>S. babylonica</i> (Koul et al, 1991), <i>S. fragilis</i> (Davison, 1965), <i>S. viminalis</i> (Bowen & Hoad, 1968), <i>S. alba</i> (Banzhaf et al, 1983) and <i>S. purpurea</i> (Gilliver, 1947). For other willow species , their “dense shade and mat-forming willow roots suppress and kill indigenous understorey” (Purtle et al, 2001b), suggesting that there might be an allelopathic basis for this lack of understorey beneath willow infestations, however no specific reference to these species was found.	M	L
6. Tolerates herb pressure?	No information	M	L
7. Normal growth rate?	“ <i>Salix</i> are fast growing trees or shrubs, rarely prostrate” (Spencer, 1997). Where growth rates are described, tree and shrub forms of <i>Salix</i> are recorded as vigorous or fast growing, eg. <i>S. alba</i> (Spencer, 1997), <i>S. glaucophylloides</i> (Newsholme, 1992), <i>S. nigra</i> (Cremer, 1995), <i>S. purpurea</i> (Webb, Sykes & Garnock-Jones, 1988) and <i>S. x rubens</i> (Meikle).	H	MH

Invasiveness Assessment Record

Scientific name: *Salix humboldtiana*

Common Name: Willows

QUESTION	COMMENTS	RATING	CONFIDENCE
8. Stress tolerance to frost, drought, w/logg, sal. etc?	FIRE “If a tree is completely girdled by fire at ground level it may die without coppicing...however young trees tend to sprout from the buried portion of their stem” (Cremer, 1999), indicating some fire tolerance in tree and shrub willows in general. FROST All tree and shrub species (except <i>S. humboldtiana</i>) in this study are recorded as tolerating USDA hardiness zones of between 1 and 6 (average minimum temperatures between –46C and –17C) (Bailey & Bailey, 1976, Griffiths, 1992). <i>S. humboldtiana</i> is susceptible to frost (Newsholme, 1992). DROUGHT All willows are described as growing on the banks or in the riverbeds of water courses or in moist locations (Carr, 1996; Carr et. al, 1992; Cody, 1996; Davis, 1982; Howard, 1988; Ladson, et al, 1997; Maloney et al, 1999; Munz, 1963; Voss, 1972; Webb, Sykes & Garnock-Jones, 1988) suggesting a low drought tolerance; and only few species (<i>S. cinerea</i> and <i>S. exigua</i>) can also establish on drier soil (but are not necessarily drought tolerant), with <i>S. purpurea</i> alone tolerating extremely dry, sandy soils (Newsholme, 1992). WATERLOGGING Those species able to grow in riverbeds must have high tolerance of waterlogging (<i>S. exigua</i>, Cody, 1996; <i>S. fragilis</i>, Maloney et al, 1999; <i>S. alba</i>, <i>S.x rubens</i>, and <i>S. viminalis</i>; Webb, Sykes & Garnock-Jones, 1988) and also <i>S. cinerea</i> (Cremer, 1999). SALINITY <i>S. alba</i> is “the most tolerant of all willows to brackish water” (Zallar). <i>S. cinerea</i> “tolerates salt-laden air” (Newsholme, 1992), <i>S. fragilis</i>, <i>S. matsudana</i> & <i>S. seringeana</i> tolerate high levels of salinity (Crouch & Honeyman, 1986). <i>S. nigra</i> has moderately high tolerance of salt (Swift, 1997) and <i>S. purpurea</i> shows “considerable tolerance for salt water” (Newsholme, 1992). <i>S. humboldtiana</i> tolerates: Fire-some, Frost-no, Drought-no, waterlogging-no, salinity-no	L	MH
Reproduction			
9. Reproductive system	Salicacea are dioecious (Tutin, 1993). <i>S. aegyptica</i> may produce male and female catkins (Tutin, 1993). There are mostly only male <i>S. humboldtiana</i> in Australia (ARMCANZ, 2001), so whilst this species can cross pollinate other willows, they produce no seed of their own and only propagate vegetatively (Newsholme, 1992).	MH	MH
10. Number of propagules produced?	See Q. 9. No seed produced.	L	MH
11. Propagule longevity?	See Q. 9. No seed produced.	L	MH
12. Reproductive period?	Following reproductive maturity “flowering tends to be ample and to occur every year” (Cremer, 1999). <i>S. cinerea</i> “stands are mostly monoculture excluding 97% of sunlight and most other species” (Cremer, 1999). The oldest stem <i>S. exigua</i> in this study was 31 years (Ottenbreit & Staniforth, 1992). An old <i>S. fragilis</i> tree was observed to 130 years (Meikle, 1984).	H	MH
13. Time to reproductive maturity?	See Q. 9. No seed produced.	M	MH

Invasiveness Assessment Record

Scientific name: *Salix humboldtiana*

Common Name: Willows

QUESTION	COMMENTS	RATING	CONFIDENCE
Dispersal			
14. Number of mechanisms?	For male <i>S. humboldtiana</i> , propagules are only spread by water (Cremer, 1999).	MH	MH
15. How far do they disperse?	For species such as <i>S. humboldtiana</i> , which only reproduce vegetatively (Newsholme, 1992), <i>S. x rubens</i> provides evidence that “very few individuals observed long distances from existing mature trees and these were downstream of cities, towns and homesteads” (Shafroth et al, 1994).	MH	MH

References cited:

- Agriculture & Resource Management Council of Australia & New Zealand (ARMCANZ) 2001, *Weeds of National Significance Willow (Salix taxa, excluding S. babylonica, S. x calodendron and S. x reichardtii) Strategic Plan*, National Weeds Strategy Executive Committee, Launceston.
- Bahnzaf R, Kranzle M, Muhle H & Winkler S 1983, ‘Effect of leaf leachates on nitrogen mineralization [German],’ *Verhandlungen der Gesellschaft für Ökologie*, vol. 10, p. 63-70.
- Bailey LH & Bailey LZ 1976 *Hortus Third*, Macmillan, New York & London.
- Besaans (ed.) 1995, *Plant Protection News* vol. 47, pp. 20-24.
- Bokarev KS, Kefeli VI & Kapeljusnikova LM 1966, ‘Chemical and physiological properties of natural inhibitors from *Salix rubra* [Russian],’ *Fizio. Rast.*, Vol. 13(2), p. 274-282.
- Bowen MR & Hoad GV 1968, ‘Inhibitor content of phloem and xylem sap obtained from willow (*Salix viminalis*) entering dormancy,’ *Planta.*, vol 81(1), p. 64-70.
- Carcaillet C, Bergeron Y, Richard PJH, Frechette B, Gauthier S & Prairie YT 2001 ‘Change of fire frequency in the eastern Canadian boreal forests during the Holocene: does vegetation composition or climate trigger the fire regime?’ *Journal of Ecology*, vol. 89, p. 930-946.
- Carr GW 1996, ‘Salix,’ in Walsh NG & Entwistle TJ (Eds.), *Flora of Victoria*, Vol. 3, Inkata Press, Melbourne.
- Carr, GW, Yogovic, JV & Robinson, KE 1992, *Environmental Weed Invasions in Victoria*, Department of Conservation and Environment, Vic.
- Cody WJ 1996, *Flora of the Yukon Territory*, NRC Research Press, Ottawa.
- Cremer KW 1995, *Willow Identification for river management in Australia*, CSIRO Division of Forestry, Orange, NSW.
- Cremer K 1999 *Willow Management for Australian Rivers* CSIRO Forestry and Forest Products, Kingston ACT.
- Cremer, K 2001 *Exterminate Wild Pussy Willows and its most invasive relative,s* CSIRO Forestry and Forest Products, Kingston ACT.
- Cremer K 2003 ‘Introduced willows can become invasive pests in Australia,’ *Biodiversity*, Vol. 4(4), p. 17-24.
- Cremer K, Van Kraayenoord C, Parker N & Streatfield S 1995, ‘Willows spreading by seed,’ *Australian Journal of Soil and Water Conservation*, Vol 8 (4), p. 18-27.
- Crouch RJ & Honeyman MN 1986, ‘The relative salt tolerance of willow cuttings,’ *Journal of Soil Conservation*, vol 42(2), p. 103-104.
- Davis PH 1982, *Flora of Turkey and the east Aegean Islands*, Vol. 7, Edinburgh Uni Press, Edinburgh.
- Davison RM 1965, ‘Some properties of a plant growth inhibitor present in xylem sap of woody species,’ *Australian Journal of Biological Sciences*, vol. 18(3), p. 475-486.
- Fircks HA von, Daurin A (ed.), Junttila O (ed.), Nilsen J 1985 ‘Frost hardiness of fast-growing *Salix* species,’ *Plant production in the north. Proceeding from ‘Plant adaptation workshop,’* Norway.

Invasiveness Assessment Record

Scientific name: *Salix humboldtiana*

Common Name: Willows

- Gilliver K 1947, 'The effect of plant extracts on the germination of the conidia of *Venturia inaequalis*,' *Ann. Appl. Biol.*, vol. 34(1), p. 136-143.
- Griffiths M 1992, *The New Royal Horticultural Society dictionary of gardening*, vol. 4, Macmillan, London.
- Haines A 2004 *Salix myrcoides* (bayberry willow) *Conservation and Research Plan for New England*, New England Flower Society, Framingham, Massachusetts, USA.
- Henderson L 1991 'Alien invasive *Salix* spp. (willows) in the grassland biome of South Africa,' *South African Forestry Journal*, vol. 157, p. 91-95.
- Hitchcock CL & Cronquist A 1964, *Vascular Plants of the Pacific Northwest (Part 2)*, University of Washington Press, Seattle & London.
- Howard RA 1988, *Flora of the Lesser Antilles*, Vol. 4, Arnold Arboretum, Harvard Uni, Jamaica Plain, Massachusetts.
- Holm L et al 1979, *A geographical atlas of world weeds*, Wiley, New York.
- Koul VK, Raina A, Dhanna YP, Tickoo ML & Singh 1991, 'Evaluation of allelopathic influence of certain farm grown tree species on rice (*Oryza sativa* L. c.v. PC 19),' *Indian Journal of Forestr*, vol. 14(1), p. 54-57.
- Ladson A, Gerrish G, Carr G, Thexton E 1997, *Willows Along Victorian Waterways*, Waterways Unit, Department of Natural Resources and Environment, Vic, Australia.
- Maloney RF, Keedwell, RJ, Wells NJ, Reergen AL & Nilsson RG 1999, 'Effect of willow removal on habitat use by five birds of braided rivers, MrKenzie Basin, New Zealand, *New Zealand Journal of Ecology*, Vol. 23, P. 53-60.
- Meikle RD 1984, *Willows and Poplars of Great Britain and Ireland*, Botanical Society of the British Isles, London.
- Munz PA & Keck DD 1963, *A California Flora*, University of California Press, Berkley & LA.
- Newsholme C 1992, *Willows: The genus Salix*, Tumber Press, Portland & Oregon.
- Ottenbreit KA & Staniforth JR 1992, 'Life cycle and age structure of ramets in an expanding population of *Salix exigua* (sandbar willow),' *Canadian Journal of Botany*, vol. 70(6), p. 1141-1146.
- Purtle C, Stelling F, Martin D, Grossman T, Frankenberg J, Campbell S & Dwyer C 2001a *Willow Identification Guide*, Department of Land and Water Conservation, NSW.
- Purtle C, Stelling F, Martin D, Grossman T, Frankenberg J, Campbell S & Dwyer C 2001b *Willows along watercourses: an introduction*, Department of Land and Water Conservation, NSW.
- Purtle C, Stelling F, Martin D, Grossman T, Frankenberg J, Campbell S & Dwyer C 2001c Department of Land and Water Conservation, NSW.
- Shafroth PB, Scott ML & Friedman JM 1994, 'Establishment, sex structure & breeding system of an exotic riparian willow, *Salix x rubens*,' *American Midland Naturalist*, vol. 132, p. 159-172.
- Spencer R 1997, *Horticultural Flora of South-Eastern Australia*, vol. 2, UNSW Press, Australia.
- Strutek M, Bauer V, Klimes L & Pinosova J 1988, 'Ecology of economically important plants in the river Luznice floodplain,' *Sbornik Vysoka Skola Zemedelska*, Vol. 5(2), p. 105-118.
- Standley PC & Steyermark JA 1958, *Flora of Guatemala*, Vol. 24, *Chicago Natural History Museum*, USA.
- Swift CE 1997, *Colorado State University Cooperative Extension*, Colorado State University, viewed: 15/02/2006, www.colostate.edu/Depts/CoopExt/TRA/PLANTS/stable.html.
- Tutin TG 1993, *Flora Europaea*, University Press, Cambridge.
- Uchytel, RJ 1989, Fire Effects Information System, U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory, viewed: 10/01/2000, <http://www.fs.fed.us/database/feis/plants/tree/salex/all.html>.
- Voss EG 1972, *Michigan Flora: A guide to the identification and occurrence of the native and naturalized seed plants of the state*, Crabrook Institute of Science, University of Michigan Herbarium, Michigan.

Invasiveness Assessment Record

Scientific name: *Salix humboldtiana*

Common Name: Willows

Walters SM et al (eds) 1989, *The European Garden Flora*, Cambridge University Press, UK.
Webb, Sykes & Garnock-Jones, 1988 CJ, Sykes WR, Garnock-Jones PJ 1988, *Flora of New Zealand*, vo.l. 4, Manaaki Whenua Press, NZ
Zallar S nd, *Botanical Characteristics of the Willows*, Soil Conservation Authority, Kew.

S. cinerea, S. fragilis, S. x rubens & S. nigra are identified by Ladson et al as outstandingly invasive because of their biology and ecology, specifically their reproductive ability.

Revisions		
Date	Revised by	Revision

Present distribution of *Salix humboldtiana* in Victoria

Scientific name: *Salix humboldtiana* Willd.

Common name(s): pencil willow

Status:

Habitat:

Native to South America and Mexico. In its native range, found along streams or in swamps and marshes, abundant in many regions, ascending from sea level to about 1900 metres (Standley & Steyermark 1958). Prefers light to medium, moist, well-drained soils in an open sunny position (Bodkin 1990). In Australia found along the coast from Nowra to Cairns (Cremer 1995).



Potential distribution of *Salix humboldtiana* in Victoria

Scientific name: *Salix humboldtiana* Willd.

Common name(s): pencil willow

Status:

Habitat:

Native to South America and Mexico. In its native range, found along streams or in swamps and marshes, abundant in many regions, ascending from sea level to about 1900 metres (Standley & Steyermark 1958). Prefers light to medium, moist, well-drained soils in an open sunny position (Bodkin 1990). In Australia found along the coast from Nowra to Cairns (Cremer 1995).

Potential distribution produced from CLIMATE modelling refined by applying suitable landuse and vegetation type overlays with CMA boundaries

MAP OVERLAYS USED.

Land Use:

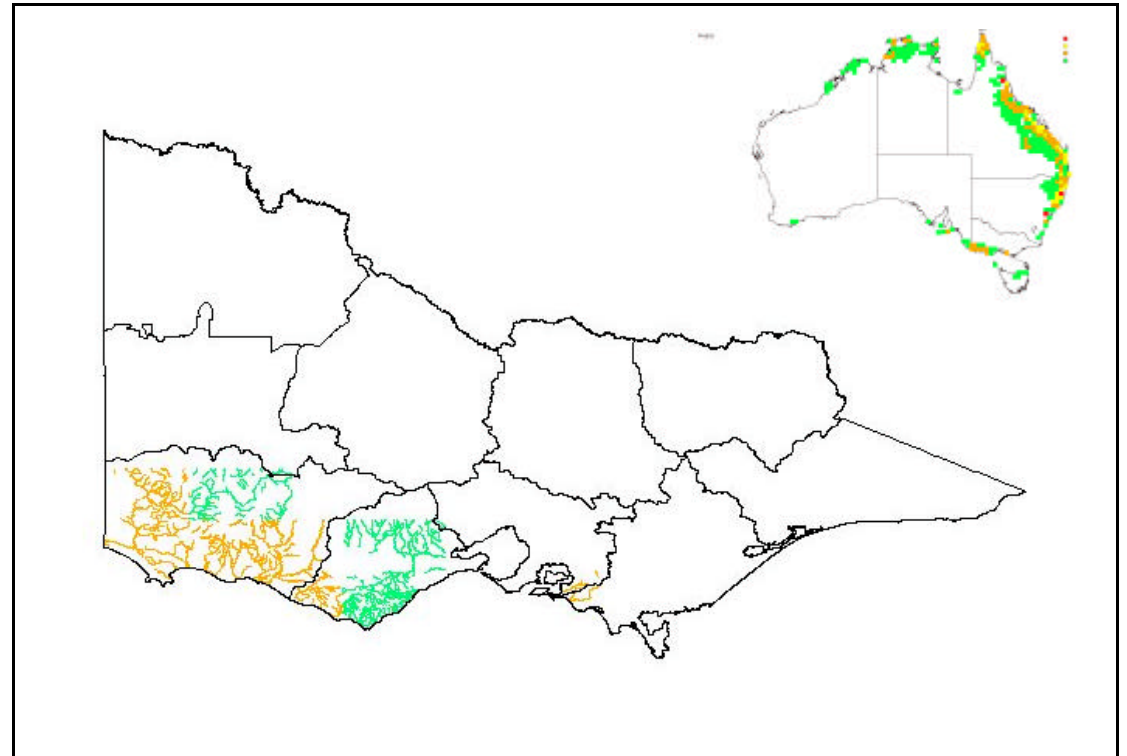
Broad vegetation types

Swamp scrub; riverine grassy woodland; riparian forest

Colours indicate possibility of *Salix humboldtiana* infesting these areas.

Red	= Very high	Yellow	= High
Orange	= Medium	Green	= Likely

In the non-coloured areas the plant is unlikely to establish as the climate, soil or landuse is not presently suitable.



Impact Assessment Record

Scientific Name: *Salix humboldtina*

Common name: Willows

QUESTION	COMMENTS	RATING	CONFIDENCE
Social			
1. Restrict human access?	<i>S. humboldtiana</i> tend to have single trunks (Haines, 2003), making them unlikely to inhibit access by humans as they don't tend to form thickets.	L	MH
2. Reduce tourism?	<i>S. humboldtiana</i> are likely to be valued in the landscape for their foliage and autumn display (Ladson et al, 1997).	L	MH
3. Injurious to people?	No reference to human injury found in any reference. Toxicity rated as 'none' for the species summarised in the USDA Plants Database (2006) including <i>S. purpurea</i> , <i>S. exigua</i> , <i>S. nigra</i> , <i>S. x sepulcralis</i> , <i>S. alba</i> . Presume no toxicity for any <i>Salix</i> .	L	MH
4. Damage to cultural sites?	As semi-aquatic species, confined to stream banks or beds or moist locations (Carr, 1996; Carr et al, 1992; Cody, 1996; Davis, 1982; Howard, 1988; Ladson et al, 1997; Maloney et al, 1999; Munz, 1963; Voss, 1972; Webb, Sykes & Garnock-Jones, 1988) willows are unlikely to grow near enough to cause structural or visual damage to cultural sites. However, during floods, senescent trees can drop large branches or trunks into waterways and a build up of material behind these snags can destroy bridges (ARMCANZ, 2001). Major damage to buildings can occur when streams change route because they have become clogged with mats of willow roots. A Tasmanian Landcare group was formed in response to flooded homes, the cause of which was attributed to stream blockages by willow roots encroaching into streams (Sarah Holland-Clift pers. comm.).	H	MH
Abiotic			
5. Impact flow?	<i>S. humboldtiana</i> is a species confined to riverbanks (Haines, 2003), which makes it unlikely to impact on flow.	L	MH
6. Impact water quality?	As deciduous plants (Carr, 1996), all shrub and tree willows have mass autumn leaf fall, which leads to decreased oxygen levels (Ladson et al, 1997). Intense shading by willows, which tend to have more dense canopies than native species decreases water temperature (Ladson et al, 1997).	H	MH
7. Increase soil erosion?	<i>S. humboldtiana</i> is a species confined to riverbanks (Haines, 2003), and is unlikely to cause erosion; indeed willows were often planted to ameliorate erosion on revegetated banks (Ladson et al, 1997).	L	MH
8. Reduce biomass?	As woody plants that can form dense thickets, or large shrubs or trees (Carr, 1996), willows are capable of increasing biomass where they replace lower or less dense vegetation as they commonly do in disturbed sites (Cremer, 1999).	L	MH
9. Change fire regime?	Willows are low flammable/combustible trees (Carcaillet et al, 2001), likely to greatly change the frequency and intensity of fire risk.	H	H

Impact Assessment Record

Scientific Name: *Salix humboldtina*

Common name: Willows

QUESTION	COMMENTS	RATING	CONFIDENCE
Community Habitat			
10. Impact on composition (a) high value EVC	Basin= Otway Coast- Chapple Creek (ISC=Excellent); CMA= Corangamite; CLIMATE= Medium; For willows in general, their “dense shade and mat-forming willow roots suppress and kill indigenous understorey” (Purtle et al, 2001b). Potential to displace some dominant species within a layer.	M	MH
(b) medium value EVC	All Victorian waterbodies are assumed to be high value EVCs.	L	H
(c) low value EVC	All Victorian waterbodies are assumed to be high value EVCs.	L	H
11. Impact on structure?	For willows in general, their “dense shade and mat-forming willow roots suppress and kill indigenous understorey” (Purtle et al, 2001b).	MH	MH
12. Effect on threatened flora?	No information found	MH	L
Fauna			
13. Effect on threatened fauna?	No information found	MH	L
14. Effect on non-threatened fauna?	Intense shading decreases primary production in waterways, impacting on invertebrates and fish (Ladson et al, 1997). Reduce indigenous vegetation which would otherwise provide habitat (especially tree hollows) and pollen and nectar food sources (Ladson, 1997) “Dense shade and mat-forming willow roots suppress and kill indigenous understorey [which is] important habitat for insects, birds and mammals. Bare banks beneath willows provide little protection for frogs, water rats, snakes, lizards and other fauna. Willows do not provide nectar for native birds...Willows also have few hollows, important habitat for over half of our woodland birds and mammals” (Purtle et al, 2001b). Reduction in habitat for fauna, leading to reduction in numbers of individuals but not to local extinction.	MH	MH
15. Benefits fauna?	Possums graze and defoliate isolated trees (ARMCANZ, 2001). The palatability of <i>S. humboldtiana</i> is unknown.	M	L
16. Injurious to fauna?	No reference to animal injury found in any reference.	L	H
Pest Animal			
17. Food source to pests?	The palatability of <i>S. humboldtiana</i> is unknown.	M	L

Impact Assessment Record

Scientific Name: *Salix humboldtina*

Common name: Willows

QUESTION	COMMENTS	RATING	CONFIDENCE
18. Provides harbor?	<i>S. humboldtiana</i> tend to have single trunks (Haines, 2003), making them unlikely to harbor vermin as they don't tend to form thickets.	L	MH
Agriculture			
19. Impact yield?	Generally willows are valued for shade and browsing for livestock (Besaans, 1995).	L	MH
20. Impact quality?	Generally willows are valued for shade and browsing for livestock (Besaans, 1995).	L	MH
21. Affect land value?	"Fibrous willow roots and dense willow foliage trap large amounts of silt which can decrease channel capacity, exacerbate flooding and change flood patterns...Willows encroaching into the centre of streams interrupt the flow of water which results in stream flows being directed into watercourse banks, causing erosion." (Purtle, 2001b). Whilst risk of floods and erosion may cause decrease in land value in some incidences, with a state wide view, this is likely to be negligible.	L	MH
22. Change land use?	Willows are associated with waterways and not recorded as invaders of pasture or crops in the extensive literature. Whilst control may be required (see Q. 23) there is little risk that land use would need to change as a consequence of their invasion of agricultural land.	L	H
23. Increase harvest costs?	<i>S. humboldtiana</i> is a species that tends to have a single trunk and is confined to riverbanks (Haines, 2003), which makes it unlikely to impact on agriculture.	L	MH
24. Disease host/vector?	Not found in the extensive literature.	L	H

References cited:

Agriculture & Resource Management Council of Australia & New Zealand (ARMCANZ) 2001, *Weeds of National Significance Willow (Salix taxa, excluding S. babylonica, S. x calodendron and S. x reichardtii)* Strategic Plan, National Weeds Strategy Executive Committee, Launceston.

Aiken SG, Dallwitz MJ, Consaul LL, McJannet CL, Gillespie LJ, Boles RL, Argus GW, Gillett JM, Scott PJ, Elven R, LeBlanc MC, Brysting AK & Solstad H 1999, *Flora of the Canadian Arctic Archipelago: Descriptions, Illustration, Identification, and Information Retrieval*, Memorial University of Newfoundland, viewed: 16/02/2006, www.mun.ca/biology/delta/arcticf/_ca/www/wl.htm.

Bailey LH & Bailey LZ 1976 *Hortus Third*, Macmillan, New York & London.

Besaans (ed.) 1995, *Plant Protection News* vol. 47, pp. 20-24.

Carcaillet C, Bergeron Y, Richard PJH, Frechette B, Gauthier S & Prairie YT 2001 'Change of fire frequency in the eastern Canadian boreal forests during the Holocene: does vegetation composition or climate trigger the fire regime?' *Journal of Ecology*, vol. 89, p. 930-946.

Carr GW 1996, 'Salix,' in Walsh NG & Entwisle TJ (Eds.), *Flora of Victoria*, Vol. 3, Inkata Press, Melbourne.

Carr, GW, Yogovic, JV & Robinson, KE 1992, *Environmental Weed Invasions in Victoria*, Department of Conservation and Environment, Vic.

Cody WJ 1996, *Flora of the Yukon Territory*, NRC Research Press, Ottawa.

Cremer KW 1995, *Willow Identification for river management in Australia*, CSIRO Division of Forestry, Orange, NSW.

Cremer K 1999 *Willow Management for Australian Rivers* CSIRO Forestry and Forest Products, Kingston ACT.

Impact Assessment Record

Scientific Name: *Salix humboldtina*

Common name: Willows

- Cremer, K 2001 *Exterminate Wild Pussy Willows and its most invasive relative,s* CSIRO Forestry and Forest Products, Kingston ACT.
- Crouch RJ & Honeyman MN 1986, 'The relative salt tolerance of willow cuttings,' *Journal of Soil Conservation*, vol 42(2), p. 103-104.
- Davis PH 1982, *Flora of Turkey and the east Aegean Islands, Vol. 7*, Edinburgh Uni Press, Edinburgh.
- Fircks HA von, Daurin A (ed.), Junttila O (ed.), Nilsen J 1985 'Frost hardiness of fast-growing *Salix* species,' *Plant production in the north. Proceeding from 'Plant adaptation workshop*,' Norway.
- Haines A 2004 *Salix myrcoides (bayberry willow) Conservation and Research Plan for New England*, New England Flower Society, Framingham, Massachusetts, USA.
- Henderson L 1991 'Alien invasive *Salix* spp. (willows) in the grassland biome of South Africa,' *South African Forestry Journal*, vol. 157, p. 91-95.
- Hitchcock CL & Cronquist A 1964, *Vascular Plants of the Pacific Northwest (Part 2)*, University of Washington Press, Seattle & London.
- Howard RA 1988, *Flora of the Lesser Antilles*, Vol. 4, Arnold Arboretum, Harvard Uni, Jamaica Plain, Massachusetts.
- Holm L et al 1979, *A geographical atlas of world weeds*, Wiley, New York.
- Kennedy SA, Ganf FF & Walker KF 2003, 'Does salinity influence the distribution of exotic willows (*Salix* spp.) along the Lower River Murray?' *Marine and Freshwater Research*, vol 54, p. 825-831.
- Ladson A, Gerrish G, Carr G, Thexton E 1997, *Willows Along Victorian Waterways*, Waterways Unit, Department of Natural Resources and Environment, Vic, Australia.
- Maloney RF, Keedwell, RJ, Wells NJ, Reergen AL & Nilsson RG 1999, 'Effect of willow removal on habitat use by five birds of braided rivers, MrKenzie Basin, New Zealand, *New Zealand Journal of Ecology*, Vol. 23, P. 53-60.
- Meikle RD 1984, *Willows and Poplars of Great Britain and Ireland*, Botanical Society of the British Isles, London.
- Munz PA & Keck DD 1963, *A California Flora*, University of California Press, Berkley & LA.
- Muyt A 2001, *Bush invaders of South-East Australia*, RG and FJ Richardson, Meredith, Vic.
- Newsholme C 1992, *Willows: The genus Salix*, Tumber Press, Portland & Oregon.
- Purtle C, Stelling F, Martin D, Grossman T, Frankenberg J, Campbell S & Dwyer C 2001a *Willow Identification Guide*, Department of Land and Water Conservation,
- Purtle C, Stelling F, Martin D, Grossman T, Frankenberg J, Campbell S & Dwyer C 2001b *Willows along watercourses: an introduction*, Department of Land and Water Conservation,
- Purtle C, Stelling F, Martin D, Grossman T, Frankenberg J, Campbell S & Dwyer C 2001c Department of Land and Water Conservation,
- Shafroth PB, Scott ML & Friedman JM 1994, 'Establishment, sex structure & breeding system of an exotic riparian willow, *Salix x rubens*,' *American Midland Naturalist*, vol. 132, p. 159-172.
- Srutek M, Bauer V, Klimes L & Pinosova J 1988, 'Ecology of economically important plants in the river Luznice floodplain,' *Sbornik Vysoka Skola Zemedelska*, Vol. 5(2), p. 105-118.
- Standley PC & Steyermark JA 1958, *Flora of Guatemala, Vol. 24*, Chicago Natural History Museum, USA.
- Swift CE 1997, *Colorado State University Cooperative Extension*, Colorado State University, viewed: 15/02/2006, www.colostate.edu/Depts/CoopExt/TRA/PLANTS/stable.html.
- Uchytil, RJ 1989, Fire Effects Information System, U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory, viewed: 16/02/2006, www.fs.fed.us/database/feis/plants/tree/salnig/all.html.
- United States Department of Agriculture (USDA) 2006 USDA Plants Database, Washington, viewed: 16/02/2006, http://plants.nrcs.usda.gov/cgi_bin/topics.cgi?earl=characteristics.html.

Impact Assessment Record

Scientific Name: *Salix humboldtina*

Common name: Willows

Voss EG 1972, *Michigan Flora: A guide to the identification and occurrence of the native and naturalized seed plants of the state*, Crabbrook Institute of Science, University of Michigan Herbarium, Michigan.

Walters SM et al (eds) 1989, *The European Garden Flora*, Cambridge University Press, UK.

Webb CJ, Sykes WR, Garnock-Jones PJ 1988, *Flora of New Zealand*, vol. 4, Manaaki Whenua Press, NZ

Zallar S nd, *Botanical Characteristics of the Willows*, Soil Conservation Authority, Kew.

Revisions

Date	Revised by	Revision

Invasiveness Assessment Record

Scientific name: *Salix matsudana*

Common Name: Willows

QUESTION	COMMENTS	RATING	CONFIDENCE
Establishment			
1. Germination requirements?	“The ‘fragility’...of willows varies greatly and this is the single most important attribute conferring invasibility...by vegetative means.” The most fragile taxa include: <i>Salix fragilis</i> , <i>S. x rubens</i> , <i>S. x pendulina</i> , <i>S. alba</i> , <i>S. x sepulcralis</i> , and <i>S. matsudana</i> ‘ <i>Torulosa</i> ’. They take root where they lodge in water or on wet ground (Ladson et al, 1997)ie. Opportunistic species.	H	MH
2. Establishment requirements?	Willows are described as heliophyllic (intolerant of shade) (Haines, 2004) and most species ...must not be overhung by larger plants or trees (Newsholme, 1992).	ML	MH
3. How much disturbance is required?	<i>S. matsudana</i> establish predominantly vegetatively (ARMCANZ, 2001), and so tend to “invade riverbanks, lakesides, drainage channels, swaps, almost all wet places” (Webb, Sykes & Garnock-Jones, 1988) that are, by their nature, disturbed ecosystems.	MH	MH
Growth/Competitive			
4. Life form?	Semi-aquatic- All willows in this study are described as growing on the banks of water courses or in moist locations. <i>S. matsudana</i> grows in riverbeds, lakesides, swamp margins, outskirts of towns and cities near rubbish dumps (Webb, Sykes & Garnock-Jones, 1988	H	MH
5. Allelopathic properties?	Of the naturalised willows in Australia, allelopathic compounds have been demonstrated in <i>S. rubra</i> (Bokarev, Kefeli & Kapeljusnikova, 1966), <i>S. babylonica</i> (Koul et al, 1991), <i>S. fragilis</i> (Davison, 1965), <i>S. viminalis</i> (Bowen & Hoad, 1968), <i>S. alba</i> (Banzhaf et al, 1983) and <i>S. purpurea</i> (Gilliver, 1947). For other willow species , their “dense shade and mat-forming willow roots suppress and kill indigenous understorey” (Purtle et al, 2001b), suggesting that there might be an allelopathic basis for this lack of understorey beneath willow infestations, however no specific reference to these species was found.	M	L
6. Tolerates herb pressure?	No information	M	L
7. Normal growth rate?	“ <i>Salix</i> are fast growing trees or shrubs, rarely prostrate” (Spencer, 1997). Where growth rates are described, tree and shrub forms of <i>Salix</i> are recorded as vigorous or fast growing, eg. <i>S. alba</i> (Spencer, 1997), <i>S. glaucophylloides</i> (Newsholme, 1992), <i>S. nigra</i> (Cremer, 1995), <i>S. purpurea</i> (Webb, Sykes & Garnock-Jones, 1988) and <i>S. x rubens</i> (Meikle).	H	MH

Invasiveness Assessment Record

Scientific name: *Salix matsudana*

Common Name: Willows

QUESTION	COMMENTS	RATING	CONFIDENCE
8. Stress tolerance to frost, drought, w/logg, sal. etc?	FIRE “If a tree is completely girdled by fire at ground level it may die without coppicing...however young trees tend to sprout from the buried portion of their stem” (Cremer, 1999), indicating some fire tolerance in tree and shrub willows in general. FROST All tree and shrub species (except <i>S. humboldtiana</i>) in this study are recorded as tolerating USDA hardiness zones of between 1 and 6 (average minimum temperatures between –46C and –17C) (Bailey & Bailey, 1976, Griffiths, 1992). <i>S. humboldtiana</i> is susceptible to frost (Newsholme, 1992). DROUGHT All willows are described as growing on the banks or in the riverbeds of water courses or in moist locations (Carr, 1996; Carr et. al, 1992; Cody, 1996; Davis, 1982; Howard, 1988; Ladson, et al, 1997; Maloney et al, 1999; Munz, 1963; Voss, 1972; Webb, Sykes & Garnock-Jones, 1988) suggesting a low drought tolerance; and only few species (<i>S. cinerea</i> and <i>S. exigua</i>) can also establish on drier soil (but are not necessarily drought tolerant), with <i>S. purpurea</i> alone tolerating extremely dry, sandy soils (Newsholme, 1992). WATERLOGGING Those species able to grow in riverbeds must have high tolerance of waterlogging (<i>S. exigua</i>, Cody, 1996; <i>S. fragilis</i>, Maloney et al, 1999; <i>S. alba</i>, <i>S.x rubens</i>, and <i>S. viminalis</i>; Webb, Sykes & Garnock-Jones, 1988) and also <i>S. cinerea</i> (Cremer, 1999). SALINITY <i>S. alba</i> is “the most tolerant of all willows to brackish water” (Zallar). <i>S. cinerea</i> “tolerates salt-laden air” (Newsholme, 1992), <i>S. fragilis</i>, <i>S. matsudana</i> & <i>S. seringeana</i> tolerate high levels of salinity (Crouch & Honeyman, 1986). <i>S. nigra</i> has moderately high tolerance of salt (Swift, 1997) and <i>S. purpurea</i> shows “considerable tolerance for salt water” (Newsholme, 1992). <i>S. matsudana</i> re highly tolerant of frost, have some tolerance of fire, and are highly tolerant of <i>either</i> waterlogging <i>or</i> salinity, but not of drought.	MH	MH
Reproduction			
9. Reproductive system	Hybrids (with <i>S. alba</i>) seed prolifically. Only female plants (of <i>S. matsudana</i> ‘Tortuosa’) are known and they produce aborted seed, however it is expected to hybridise with other willows (Carr, 1996). “Produces viable [hybrid] seed” (Cremer, 1995). Capable of reproducing both vegetatively and by seed.	H	MH
10. Number of propagules produced?	“A large crown would produce over 500 000 seeds (Cremer, 1999). Seeds numerous, very small, each with a tuft of long hairs (Tutin, 1993).	H	MH
11. Propagule longevity?	“Willow seed is very short-lived” with longer-lived species recorded at surviving 8-10 weeks (Cremer, 1999).	L	MH
12. Reproductive period?	Following reproductive maturity “flowering tends to be ample and to occur every year” (Cremer, 1999). <i>S. cinerea</i> “stands are mostly monoculture excluding 97% of sunlight and most other species” (Cremer, 1999). The oldest stem <i>S. exigua</i> in this study was 31 years (Ottenbreit & Staniforth, 1992). An old <i>S. fragilis</i> tree was observed to 130 years (Meikle, 1984).	H	MH

Invasiveness Assessment Record

Scientific name: *Salix matsudana*

Common Name: Willows

QUESTION	COMMENTS	RATING	CONFIDENCE
13. Time to reproductive maturity?	“Flowering and the production of viable seed may begin two to three years after germination, provided the plant is at least 1m tall if it is a shrub willow, or 2m tall if it is a tree willow...In some taxa (eg. <i>S. alba</i>) flowering tends to begin at larger sizes” (Cremer, 1999), which is probably still within 5 years. For plants that have reproduced vegetatively, this may be reduced, as in <i>S. nigra</i>, observed flowering on cuttings produced from < 1 year old growth (Crouch & Honeyman, 1986).	ML	MH
Dispersal			
14. Number of mechanisms?	Vegetative propagules and seed spread by water. “Seed is easily carried by wind” (Cremer, 1999).	H	MH
15. How far do they disperse?	In species where vegetative reproduction predominates such as <i>S. matsudana</i> (ARMCANZ, 2001), <i>S. x rubens</i> provides evidence that “very few individuals observed long distances from existing mature trees and these were downstream of cities, towns and homesteads” (Shafroth et al, 1994).	MH	MH

References cited:

- Agriculture & Resource Management Council of Australia & New Zealand (ARMCANZ) 2001, *Weeds of National Significance Willow (Salix taxa, excluding S. babylonica, S. x calodendron and S. x reichardtii) Strategic Plan*, National Weeds Strategy Executive Committee, Launceston.
- Bahnzaf R, Kranzle M, Muhle H & Winkler S 1983, ‘Effect of leaf leachates on nitrogen mineralization [German],’ *Verhandlungen der Gesellschaft fur Okologie*, vol. 10, p. 63-70.
- Bailey LH & Bailey LZ 1976 *Hortus Third*, Macmillan, New York & London.
- Besaans (ed.) 1995, *Plant Protection News* vol. 47, pp. 20-24.
- Bokarev KS, Kefeli VI & Kapeljusnikova LM 1966, ‘Chemical and physiological properties of natural inhibitors from *Salix rubra* [Russian],’ *Fizio. Rast.*, Vol. 13(2), p. 274-282.
- Bowen MR & Hoad GV 1968, ‘Inhibitor content of phloem and xylem sap obtained from willow (*Salix viminalis*) entering dormancy,’ *Planta.*, vol 81(1), p. 64-70.
- Carcaillet C, Bergeron Y, Richard PJH, Frechette B, Gauthier S & Prairie YT 2001 ‘Change of fire frequency in the eastern Canadian boreal forests during the Holocene: does vegetation composition or climate trigger the fire regime?’ *Journal of Ecology*, vol. 89, p. 930-946.
- Carr GW 1996, ‘Salix,’ in Walsh NG & Entwisle TJ (Eds.), *Flora of Victoria*, Vol. 3, Inkata Press, Melbourne.
- Carr, GW, Yogovic, JV & Robinson, KE 1992, *Environmental Weed Invasions in Victoria*, Department of Conservation and Environment, Vic.
- Cody WJ 1996, *Flora of the Yukon Territory*, NRC Research Press, Ottawa.
- Cremer KW 1995, *Willow Identification for river management in Australia*, CSIRO Division of Forestry, Orange, NSW.
- Cremer K 1999 *Willow Management for Australian Rivers* CSIRO Forestry and Forest Products, Kingston ACT.
- Cremer, K 2001 *Exterminate Wild Pussy Willows and its most invasive relative,s* CSIRO Forestry and Forest Products, Kingston ACT.
- Cremer K 2003 ‘Introduced willows can become invasive pests in Australia,’ *Biodiversity*, Vol. 4(4), p. 17-24.
- Cremer K, Van Kraayenoord C, Parker N & Streatfield S 1995, ‘Willows spreading by seed,’ *Australian Journal of Soil and Water Conservation*, Vol 8 (4), p. 18-27.
- Crouch RJ & Honeyman MN 1986, ‘The relative slat tolerance of willow cuttings,’ *Journal of Soil Conservation*, vol 42(2), p. 103-104.
- Davis PH 1982, *Flora of Turkey and the east Aegean Islands*, Vol. 7, Edinburgh Uni Press, Edinburgh.
- Davison RM 1965, ‘Some properties of a plant growth inhibitor present in xylem sap of woody species,’ *Australian Journal of Biological Sciences*, vol. 18(3), p. 475-486.

Invasiveness Assessment Record

Scientific name: *Salix matsudana*

Common Name: Willows

Fircks HA von, Daurin A (ed.), Junttila O (ed.), Nilsen J 1985 'Frost hardiness of fast-growing *Salix* species,' *Plant production in the north. Proceeding from 'Plant adaptation workshop,'* Norway.

Gilliver K 1947, 'The effect of plant extracts on the germination of the conidia of *Venturia inaequalis*,' *Ann. Appl. Biol.*, vol. 34(1), p. 136-143.

Griffiths M 1992, *The New Royal Horticultural Society dictionary of gardening*, vol. 4, Macmillan, London.

Haines A 2004 *Salix myrcoides (bayberry willow) Conservation and Research Plan for New England*, New England Flower Society, Framingham, Massachusetts, USA.

Henderson L 1991 'Alien invasive *Salix* spp. (willows) in the grassland biome of South Africa,' *South African Forestry Journal*, vol. 157, p. 91-95.

Hitchcock CL & Cronquist A 1964, *Vascular Plants of the Pacific Northwest (Part 2)*, University of Washington Press, Seattle & London.

Howard RA 1988, *Flora of the Lesser Antilles*, Vol. 4, Arnold Arboretum, Harvard Uni, Jamaica Plain, Massachusetts.

Holm L et al 1979, *A geographical atlas of world weeds*, Wiley, New York.

Koul VK, Raina A, Dhanna YP, Tickoo ML & Singh 1991, 'Evaluation of allelopathic influence of certain farm grown tree species on rice (*Oryza sativa* L. c.v. PC 19),' *Indian Journal of Forestr*, vol. 14(1), p. 54-57.

Ladson A, Gerrish G, Carr G, Thexton E 1997, *Willows Along Victorian Waterways*, Waterways Unit, Department of Natural Resources and Environment, Vic, Australia.

Maloney RF, Keedwell, RJ, Wells NJ, Reergen AL & Nilsson RG 1999, 'Effect of willow removal on habitat use by five birds of braided rivers, MrKenzie Basin, New Zealand, *New Zealand Journal of Ecology*, Vol. 23, P. 53-60.

Meikle RD 1984, *Willows and Poplars of Great Britain and Ireland*, Botanical Society of the British Isles, London.

Munz PA & Keck DD 1963, *A California Flora*, University of California Press, Berkley & LA.

Newsholme C 1992, *Willows: The genus Salix*, Tumber Press, Portland & Oregon.

Ottenbreit KA & Staniforth JR 1992, 'Life cycle and age structure of ramets in an expanding population of *Salix exigua* (sandbar willow),' *Canadian Journal of Botany*, vol. 70(6), p. 1141-1146.

Purtle C, Stelling F, Martin D, Grossman T, Frankenberg J, Campbell S & Dwyer C 2001a *Willow Identification Guide*, Department of Land and Water Conservation, NSW.

Purtle C, Stelling F, Martin D, Grossman T, Frankenberg J, Campbell S & Dwyer C 2001b *Willows along watercourses: an introduction*, Department of Land and Water Conservation, NSW.

Purtle C, Stelling F, Martin D, Grossman T, Frankenberg J, Campbell S & Dwyer C 2001c Department of Land and Water Conservation, NSW.

Shafroth PB, Scott ML & Friedman JM 1994, 'Establishment, sex structure & breeding system of an exotic riparian willow, *Salix x rubens*,' *American Midland Naturalist*, vol. 132, p. 159-172.

Spencer R 1997, *Horticultural Flora of South-Eastern Australia*, vol. 2, UNSW Press, Australia.

Strutek M, Bauer V, Klimes L & Pinosova J 1988, 'Ecology of economically important plants in the river Luznice floodplain,' *Sbornik Vysoka Skola Zemedelska*, Vol. 5(2), p. 105-118.

Standley PC & Steyermark JA 1958, *Flora of Guatemala*, Vol. 24, *Chicago Natural History Museum*, USA.

Swift CE 1997, *Colorado State University Cooperative Extension*, Colorado State University, viewed: 15/02/2006, www.colostate.edu/Depts/CoopExt/TRA/PLANTS/stable.html.

Tutin TG 1993, *Flora Europaea*, University Press, Cambridge.

Uchytel, RJ 1989, Fire Effects Information System, U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory, viewed: 10/01/2000, <http://www.fs.fed.us/database/feis/plants/tree/salex/all.html>.

Voss EG 1972, *Michigan Flora: A guide to the identification and occurrence of the native and naturalized seed plants of the state*, Crabrook Institute of Science, University of Michigan Herbarium, Michigan.

Walters SM et al (eds) 1989, *The European Garden Flora*, Cambridge University Press, UK.

Invasiveness Assessment Record

Scientific name: *Salix matsudana*

Common Name: Willows

Webb, Sykes & Garnock-Jones, 1988 CJ, Sykes WR, Garnock-Jones PJ 1988, *Flora of New Zealand*, vo.l. 4, Manaaki Whenua Press, NZ

Zallar S nd, *Botanical Characteristics of the Willows*, Soil Conservation Authority, Kew.

S. cinerea, S. fragilis, S. x rubens & S. nigra are identified by Ladson et al as outstandingly invasive because of their biology and ecology, specifically their reproductive ability.

Revisions

Date

Revised by

Revision

Present distribution of *Salix matsudana* in Victoria

Scientific name: *Salix matsudana* Koidzumi

Common name(s): corkscrew willow

Status:

Habitat:

Riverbeds, lakesides, swamp margins, outskirts of towns and cities near rubbish dumps (Webb et al 1988).



Potential distribution of *Salix matsudana* in Victoria

Scientific name: *Salix matsudana* Koidzumi

Common name(s): corkscrew willow

Status:

Habitat:

Riverbeds, lakesides, swamp margins, outskirts of towns and cities near rubbish dumps (Webb et al 1988).

Potential distribution produced from CLIMATE modelling refined by applying suitable landuse and vegetation type overlays with CMA boundaries

MAP OVERLAYS USED.

Land Use:

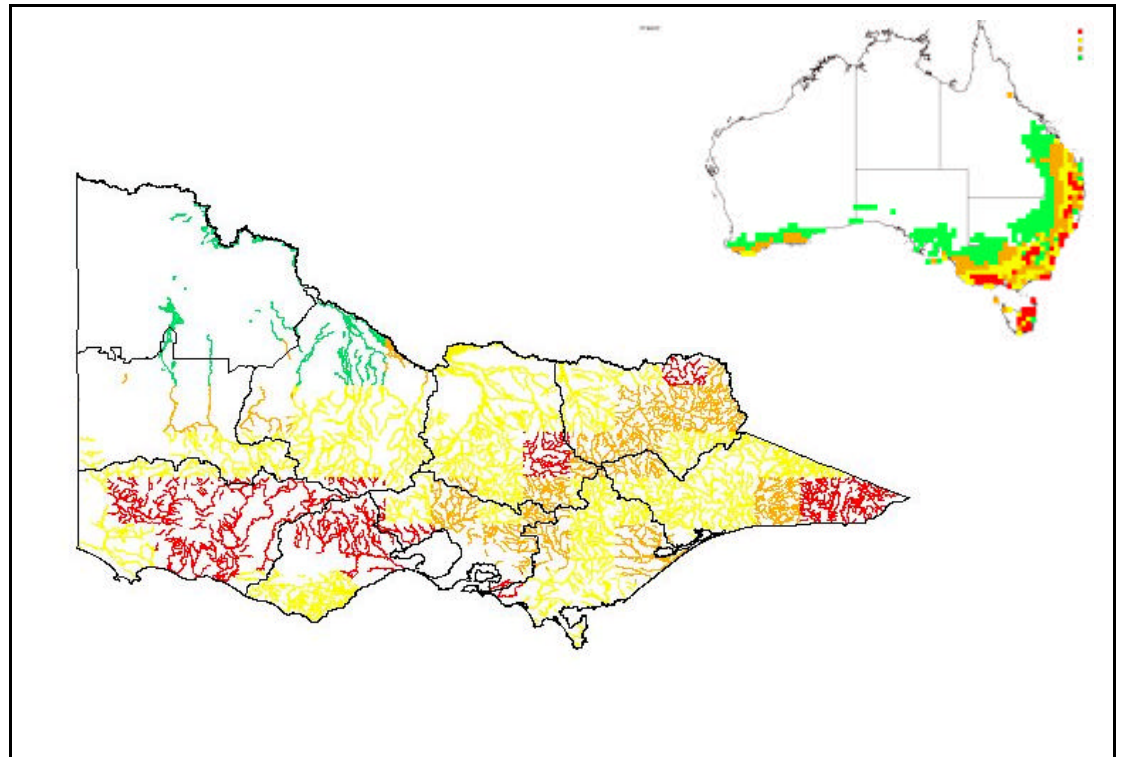
Broad vegetation types

Swamp scrub; riverine grassy woodland; riparian forest

Colours indicate possibility of *Salix matsudana* infesting these areas.

 Red	= Very high	 Yellow	= High
 Orange	= Medium	 Green	= Likely

In the non-coloured areas the plant is unlikely to establish as the climate, soil or landuse is not presently suitable.



Impact Assessment Record

Scientific Name: *Salix matsudana*

Common name: Willows

QUESTION	COMMENTS	RATING	CONFIDENCE
Social			
1. Restrict human access?	<i>S. matsudana</i> tend to have single trunks (Cremer, 1995), making them less likely to inhibit access by humans as they don't tend to form thickets.	L	MH
2. Reduce tourism?	<i>S. matsudana</i> are likely to be valued in the landscape for their foliage and autumn display (Ladson et al, 1997).	L	MH
3. Injurious to people?	No reference to human injury found in any reference. Toxicity rated as 'none' for the species summarised in the USDA Plants Database (2006) including <i>S. purpurea</i> , <i>S. exigua</i> , <i>S. nigra</i> , <i>S. x sepulcralis</i> , <i>S. alba</i> . Presume no toxicity for any <i>Salix</i> .	L	MH
4. Damage to cultural sites?	As semi-aquatic species, confined to stream banks or beds or moist locations (Carr, 1996; Carr et al, 1992; Cody, 1996; Davis, 1982; Howard, 1988; Ladson et al, 1997; Maloney et al, 1999; Munz, 1963; Voss, 1972; Webb, Sykes & Garnock-Jones, 1988) willows are unlikely to grow near enough to cause structural or visual damage to cultural sites. However, during floods, senescent trees can drop large branches or trunks into waterways and a build up of material behind these snags can destroy bridges (ARMCANZ, 2001). Major damage to buildings can occur when streams change route because they have become clogged with mats of willow roots. A Tasmanian Landcare group was formed in response to flooded homes, the cause of which was attributed to stream blockages by willow roots encroaching into streams (Sarah Holland-Clift pers. comm.).	H	MH
Abiotic			
5. Impact flow?	<i>S. matsudana</i> is a species confined to riverbanks (Cremer, 1995), which makes it unlikely to impact on flow.	L	MH
6. Impact water quality?	As deciduous plants (Carr, 1996), all shrub and tree willows have mass autumn leaf fall, which leads to decreased oxygen levels (Ladson et al, 1997). Intense shading by willows, which tend to have more dense canopies than native species decreases water temperature (Ladson et al, 1997).	H	MH
7. Increase soil erosion?	<i>S. matsudana</i> is a species confined to riverbanks (Cremer, 1995) and is unlikely to cause erosion; indeed willows were often planted to ameliorate erosion on revegetated banks (Ladson et al, 1997).	L	MH
8. Reduce biomass?	As woody plants that can form dense thickets, or large shrubs or trees (Carr, 1996), willows are capable of increasing biomass where they replace lower or less dense vegetation as they commonly do in disturbed sites (Cremer, 1999).	L	MH
9. Change fire regime?	Willows are low flammable/combustible trees (Carcaillet et al, 2001), likely to greatly change the frequency and intensity of fire risk.	H	H

Impact Assessment Record

Scientific Name: *Salix matsudana*

Common name: Willows

QUESTION	COMMENTS	RATING	CONFIDENCE
Community Habitat			
10. Impact on composition (a) high value EVC	Basin=Snowy River- Cann River (ISC=Excellent); CMA=East Gippsland; CLIMATE=VH; For willows in general, their “dense shade and mat-forming willow roots suppress and kill indigenous understorey” (Purtle et al, 2001b). Potential for major displacement of dominant species in a specific layer.	MH	MH
(b) medium value EVC	All Victorian waterbodies are assumed to be high value EVCs.	L	H
(c) low value EVC	All Victorian waterbodies are assumed to be high value EVCs.	L	H
11. Impact on structure?	For willows in general, their “dense shade and mat-forming willow roots suppress and kill indigenous understorey” (Purtle et al, 2001b).	MH	MH
12. Effect on threatened flora?	No information found.	MH	L
Fauna			
13. Effect on threatened fauna?	No information found.	MH	L
14. Effect on non-threatened fauna?	Intense shading decreases primary production in waterways, impacting on invertebrates and fish (Ladson et al, 1997). Reduce indigenous vegetation which would otherwise provide habitat (especially tree hollows) and pollen and nectar food sources (Ladson, 1997) “Dense shade and mat-forming willow roots suppress and kill indigenous understorey [which is] important habitat for insects, birds and mammals. Bare banks beneath willows provide little protection for frogs, water rats, snakes, lizards and other fauna. Willows do not provide nectar for native birds...Willows also have few hollows, important habitat for over half of our woodland birds and mammals” (Purtle et al, 2001b). Reduction in habitat for fauna, leading to reduction in numbers of individuals but not to local extinction.	MH	MH
15. Benefits fauna?	Possums graze and defoliate isolated trees (ARMCANZ, 2001). The palatability of <i>S. matsudana</i> is unknown.	M	L
16. Injurious to fauna?	No reference to animal injury found in any reference.	L	H
Pest Animal			
17. Food source to pests?	The palatability of <i>S. matsudana</i> is unknown.	M	L

Impact Assessment Record

Scientific Name: *Salix matsudana*

Common name: Willows

QUESTION	COMMENTS	RATING	CONFIDENCE
18. Provides harbor?	<i>S. matsudana</i> tend to have single trunks (Cremer, 1995), making them unlikely to harbor vermin as they don't tend to form thickets.	L	MH
Agriculture			
19. Impact yield?	Generally willows are valued for shade and browsing for livestock (Besaans, 1995).	L	MH
20. Impact quality?	Generally willows are valued for shade and browsing for livestock (Besaans, 1995).	L	MH
21. Affect land value?	"Fibrous willow roots and dense willow foliage trap large amounts of silt which can decrease channel capacity, exacerbate flooding and change flood patterns...Willows encroaching into the centre of streams interrupt the flow of water which results in stream flows being directed into watercourse banks, causing erosion." (Purtle, 2001b). Whilst risk of floods and erosion may cause decrease in land value in some incidences, with a state wide view, this is likely to be negligible.	L	MH
22. Change land use?	Willows are associated with waterways and not recorded as invaders of pasture or crops in the extensive literature. Whilst control may be required (see Q. 23) there is little risk that land use would need to change as a consequence of their invasion of agricultural land.	L	H
23. Increase harvest costs?	<i>S. matsudana</i> is a species that tends to have a single trunk and is confined to riverbanks (Cremer, 1995), which makes it unlikely to impact on agriculture.	L	MH
24. Disease host/vector?	Not found in the extensive literature.	L	H

References cited:

Agriculture & Resource Management Council of Australia & New Zealand (ARMCANZ) 2001, *Weeds of National Significance Willow (Salix taxa, excluding S. babylonica, S. x calodendron and S. x reichardtii) Strategic Plan*, National Weeds Strategy Executive Committee, Launceston.

Aiken SG, Dallwitz MJ, Consaul LL, McJannet CL, Gillespie LJ, Boles RL, Argus GW, Gillett JM, Scott PJ, Elven R, LeBlanc MC, Brysting AK & Solstad H 1999, *Flora of the Canadian Arctic Archipelago: Descriptions, Illustration, Identification, and Information Retrieval*, Memorial University of Newfoundland, viewed: 16/02/2006, www.mun.ca/biology/delta/arcticf/_ca/www/wl.htm.

Bailey LH & Bailey LZ 1976 *Hortus Third*, Macmillan, New York & London.

Besaans (ed.) 1995, *Plant Protection News* vol. 47, pp. 20-24.

Carcaillet C, Bergeron Y, Richard PJH, Frechette B, Gauthier S & Prairie YT 2001 'Change of fire frequency in the eastern Canadian boreal forests during the Holocene: does vegetation composition or climate trigger the fire regime?' *Journal of Ecology*, vol. 89, p. 930-946.

Carr GW 1996, 'Salix,' in Walsh NG & Entwistle TJ (Eds.), *Flora of Victoria*, Vol. 3, Inkata Press, Melbourne.

Carr, GW, Yogovic, JV & Robinson, KE 1992, *Environmental Weed Invasions in Victoria*, Department of Conservation and Environment, Vic.

Cody WJ 1996, *Flora of the Yukon Territory*, NRC Research Press, Ottawa.

Cremer KW 1995, *Willow Identification for river management in Australia*, CSIRO Division of Forestry, Orange, NSW.

Cremer K 1999 *Willow Management for Australian Rivers* CSIRO Forestry and Forest Products, Kingston ACT.

Impact Assessment Record

Scientific Name: *Salix matsudana*

Common name: Willows

- Cremer, K 2001 *Exterminate Wild Pussy Willows and its most invasive relative,s* CSIRO Forestry and Forest Products, Kingston ACT.
- Crouch RJ & Honeyman MN 1986, 'The relative salt tolerance of willow cuttings,' *Journal of Soil Conservation*, vol 42(2), p. 103-104.
- Davis PH 1982, *Flora of Turkey and the east Aegean Islands, Vol. 7*, Edinburgh Uni Press, Edinburgh.
- Fircks HA von, Daurin A (ed.), Junttila O (ed.), Nilsen J 1985 'Frost hardiness of fast-growing *Salix* species,' *Plant production in the north. Proceeding from 'Plant adaptation workshop*,' Norway.
- Haines A 2004 *Salix myrcoides (bayberry willow) Conservation and Research Plan for New England*, New England Flower Society, Framingham, Massachusetts, USA.
- Henderson L 1991 'Alien invasive *Salix* spp. (willows) in the grassland biome of South Africa,' *South African Forestry Journal*, vol. 157, p. 91-95.
- Hitchcock CL & Cronquist A 1964, *Vascular Plants of the Pacific Northwest (Part 2)*, University of Washington Press, Seattle & London.
- Howard RA 1988, *Flora of the Lesser Antilles*, Vol. 4, Arnold Arboretum, Harvard Uni, Jamaica Plain, Massachusetts.
- Holm L et al 1979, *A geographical atlas of world weeds*, Wiley, New York.
- Kennedy SA, Ganf FF & Walker KF 2003, 'Does salinity influence the distribution of exotic willows (*Salix* spp.) along the Lower River Murray?' *Marine and Freshwater Research*, vol 54, p. 825-831.
- Ladson A, Gerrish G, Carr G, Thexton E 1997, *Willows Along Victorian Waterways*, Waterways Unit, Department of Natural Resources and Environment, Vic, Australia.
- Maloney RF, Keedwell, RJ, Wells NJ, Reergen AL & Nilsson RG 1999, 'Effect of willow removal on habitat use by five birds of braided rivers, MrKenzie Basin, New Zealand, *New Zealand Journal of Ecology*, Vol. 23, P. 53-60.
- Meikle RD 1984, *Willows and Poplars of Great Britain and Ireland*, Botanical Society of the British Isles, London.
- Munz PA & Keck DD 1963, *A California Flora*, University of California Press, Berkley & LA.
- Muyt A 2001, *Bush invaders of South-East Australia*, RG and FJ Richardson, Meredith, Vic.
- Newsholme C 1992, *Willows: The genus Salix*, Tumber Press, Portland & Oregon.
- Purtle C, Stelling F, Martin D, Grossman T, Frankenberg J, Campbell S & Dwyer C 2001a *Willow Identification Guide*, Department of Land and Water Conservation,
- Purtle C, Stelling F, Martin D, Grossman T, Frankenberg J, Campbell S & Dwyer C 2001b *Willows along watercourses: an introduction*, Department of Land and Water Conservation,
- Purtle C, Stelling F, Martin D, Grossman T, Frankenberg J, Campbell S & Dwyer C 2001c Department of Land and Water Conservation,
- Shafroth PB, Scott ML & Friedman JM 1994, 'Establishment, sex structure & breeding system of an exotic riparian willow, *Salix x rubens*,' *American Midland Naturalist*, vol. 132, p. 159-172.
- Srutek M, Bauer V, Klimes L & Pinosova J 1988, 'Ecology of economically important plants in the river Luznice floodplain,' *Sbornik Vysoka Skola Zemedelska*, Vol. 5(2), p. 105-118.
- Standley PC & Steyermark JA 1958, *Flora of Guatemala, Vol. 24*, Chicago Natural History Museum, USA.
- Swift CE 1997, *Colorado State University Cooperative Extension*, Colorado State University, viewed: 15/02/2006, www.colostate.edu/Depts/CoopExt/TRA/PLANTS/stable.html.
- Uchytil, RJ 1989, Fire Effects Information System, U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory, viewed: 16/02/2006, www.fs.fed.us/database/feis/plants/tree/salnig/all.html.
- United States Department of Agriculture (USDA) 2006 USDA Plants Database, Washington, viewed: 16/02/2006, http://plants.nrcs.usda.gov/cgi_bin/topics.cgi?earl=characteristics.html.

Impact Assessment Record

Scientific Name: *Salix matsudana*

Common name: Willows

Voss EG 1972, *Michigan Flora: A guide to the identification and occurrence of the native and naturalized seed plants of the state*, Crabrook Institute of Science, University of Michigan Herbarium, Michigan.

Walters SM et al (eds) 1989, *The European Garden Flora*, Cambridge University Press, UK.

Webb CJ, Sykes WR, Garnock-Jones PJ 1988, *Flora of New Zealand*, vol. 4, Manaaki Whenua Press, NZ

Zallar S nd, *Botanical Characteristics of the Willows*, Soil Conservation Authority, Kew.

Revisions

Date	Revised by	Revision

Invasiveness Assessment Record

Scientific name: *Salix nigra*

Common Name: Willows

QUESTION	COMMENTS	RATING	CONFIDENCE
Establishment			
1. Germination requirements?	<i>S. cinerea</i> spreads by seed to riparian as well as other moist to wet habitats, and this is of special concern.” (Cremer, 1999). “ <i>S. nigra</i> has the potential to behave in the same invasive manner as <i>S. cinerea</i> in wetlands” (Ladson et al, 1989). These species do not need uncommon natural events for germination.	MH	MH
2. Establishment requirements?	Willows are described as heliophyllic (intolerant of shade) (Haines, 2004) and most species ...must not be overhung by larger plants or trees (Newsholme, 1992).	ML	MH
3. How much disturbance is required?	<i>S. nigra</i> generally invade as seedlings (Carr, 1996) and so are “virtually restricted to bare sediment that is wet for weeks or months following seed shed [and] seedlings need much light” (Cremer, 1999). This is a major disturbance with little or no competition from other plant species.	L	MH
Growth/Competitive			
4. Life form?	Semi-aquatic- All willows are described as growing on the banks of water courses or in moist locations. <i>S. nigra</i> grow in “streams in pastoral country...opening in pine and eucalypt forest” (Cremer, 1999) and offstream wetlands (Ladson et al, 1997).	H	MH
5. Allelopathic properties?	Of the naturalised willows in Australia, allelopathic compounds have been demonstrated in <i>S. rubra</i> (Bokarev, Kefeli & Kapeljusnikova, 1966), <i>S. babylonica</i> (Koul et al, 1991), <i>S. fragilis</i> (Davison, 1965), <i>S. viminalis</i> (Bowen & Hoad, 1968), <i>S. alba</i> (Banzhaf et al, 1983) and <i>S. purpurea</i> (Gilliver, 1947). For other willow species , their “dense shade and mat-forming willow roots suppress and kill indigenous understorey” (Purtle et al, 2001b), suggesting that there might be an allelopathic basis for this lack of understorey beneath willow infestations, however no specific reference to these species was found.	M	L
6. Tolerates herb pressure?	No information	M	L
7. Normal growth rate?	“ <i>Salix</i> are fast growing trees or shrubs, rarely prostrate” (Spencer, 1997). Where growth rates are described, tree and shrub forms of <i>Salix</i> are recorded as vigorous or fast growing, eg. <i>S. alba</i> (Spencer, 1997), <i>S. glaucophylloides</i> (Newsholme, 1992), <i>S. nigra</i> (Cremer, 1995), <i>S. purpurea</i> (Webb, Sykes & Garnock-Jones, 1988) and <i>S. x rubens</i> (Meikle).	H	MH

Invasiveness Assessment Record

Scientific name: *Salix nigra*

Common Name: Willows

QUESTION	COMMENTS	RATING	CONFIDENCE
8. Stress tolerance to frost, drought, w/logg, sal. etc?	FIRE “If a tree is completely girdled by fire at ground level it may die without coppicing...however young trees tend to sprout from the buried portion of their stem” (Cremer, 1999), indicating some fire tolerance in tree and shrub willows in general. FROST All tree and shrub species (except <i>S. humboldtiana</i>) in this study are recorded as tolerating USDA hardiness zones of between 1 and 6 (average minimum temperatures between –46C and –17C) (Bailey & Bailey, 1976, Griffiths, 1992). <i>S. humboldtiana</i> is susceptible to frost (Newsholme, 1992). DROUGHT All willows are described as growing on the banks or in the riverbeds of water courses or in moist locations (Carr, 1996; Carr et. al, 1992; Cody, 1996; Davis, 1982; Howard, 1988; Ladson, et al, 1997; Maloney et al, 1999; Munz, 1963; Voss, 1972; Webb, Sykes & Garnock-Jones, 1988) suggesting a low drought tolerance; and only few species (<i>S. cinerea</i> and <i>S. exigua</i>) can also establish on drier soil (but are not necessarily drought tolerant), with <i>S. purpurea</i> alone tolerating extremely dry, sandy soils (Newsholme, 1992). WATERLOGGING Those species able to grow in riverbeds must have high tolerance of waterlogging (<i>S. exigua</i>, Cody, 1996; <i>S. fragilis</i>, Maloney et al, 1999; <i>S. alba</i>, <i>S.x rubens</i>, and <i>S. viminalis</i>; Webb, Sykes & Garnock-Jones, 1988) and also <i>S. cinerea</i> (Cremer, 1999). SALINITY <i>S. alba</i> is “the most tolerant of all willows to brackish water” (Zallar). <i>S. cinerea</i> “tolerates salt-laden air” (Newsholme, 1992), <i>S. fragilis</i>, <i>S. matsudana</i> & <i>S. seringeana</i> tolerate high levels of salinity (Crouch & Honeyman, 1986). <i>S. nigra</i> has moderately high tolerance of salt (Swift, 1997) and <i>S. purpurea</i> shows “considerable tolerance for salt water” (Newsholme, 1992). <i>S. nigra</i> are highly tolerant of frost, have some tolerance of fire, and are highly tolerant of <i>either</i> waterlogging <i>or</i> salinity, but not of drought.	MH	MH
Reproduction			
9. Reproductive system	<i>S. nigra</i> Seeds and possible vegetatively...brittle twigs (Spencer, 1997). Abundantly recruiting by seed...probably also reproducing vegetatively (Carr, 1996). Capable of reproduction vegetatively and also by seed	H	MH
10. Number of propagules produced?	“A large crown would produce over 500 000 seeds (Cremer, 1999). Seeds numerous, very small, each with a tuft of long hairs (Tutin, 1993).	H	MH
11. Propagule longevity?	“Willow seed is very short-lived” with longer-lived species recorded at surviving 8-10 weeks (Cremer, 1999).	L	MH
12. Reproductive period?	Following reproductive maturity “flowering tends to be ample and to occur every year” (Cremer, 1999). <i>S. cinerea</i> “stands are mostly monoculture excluding 97% of sunlight and most other species” (Cremer, 1999). The oldest stem <i>S. exigua</i> in this study was 31 years (Ottenbreit & Staniforth, 1992). An old <i>S. fragilis</i> tree was observed to 130 years (Meikle, 1984).	H	MH

Invasiveness Assessment Record

Scientific name: *Salix nigra*

Common Name: Willows

QUESTION	COMMENTS	RATING	CONFIDENCE
13. Time to reproductive maturity?	“Flowering and the production of viable seed may begin two to three years after germination, provided the plant is at least 1m tall if it is a shrub willow, or 2m tall if it is a tree willow...In some taxa (eg. <i>S. alba</i>) flowering tends to begin at larger sizes” (Cremer, 1999), which is probably still within 5 years. For plants that have reproduced vegetatively, this may be reduced, as in <i>S. nigra</i>, observed flowering on cuttings produced from < 1 year old growth (Crouch & Honeyman, 1986).	ML	MH
Dispersal			
14. Number of mechanisms?	Vegetative propagules and seed spread by water. “Seed is easily carried by wind” (Cremer, 1999).	H	MH
15. How far do they disperse?	“Seed is easily carried by wind for more than 1km and some travels for up to 50km or even 100km (Cremer, 1999) for species that commonly reproduce by seed, such as <i>S. nigra</i> (ARMCANZ, 2001).	H	MH

References cited:

- Agriculture & Resource Management Council of Australia & New Zealand (ARMCANZ) 2001, *Weeds of National Significance Willow (Salix taxa, excluding S. babylonica, S. x calodendron and S. x reichardtii) Strategic Plan*, National Weeds Strategy Executive Committee, Launceston.
- Bahnzaf R, Kranzle M, Muhle H & Winkler S 1983, ‘Effect of leaf leachates on nitrogen mineralization [German],’ *Verhandlungen der Gesellschaft fur Okologie*, vol. 10, p. 63-70.
- Bailey LH & Bailey LZ 1976 *Hortus Third*, Macmillan, New York & London.
- Besaans (ed.) 1995, *Plant Protection News* vol. 47, pp. 20-24.
- Bokarev KS, Kefeli VI & Kapeljusnikova LM 1966, ‘Chemical and physiological properties of natural inhibitors from *Salix rubra* [Russian],’ *Fizio. Rast.*, Vol. 13(2), p. 274-282.
- Bowen MR & Hoad GV 1968, ‘Inhibitor content of phloem and xylem sap obtained from willow (*Salix viminalis*) entering dormancy,’ *Planta.*, vol 81(1), p. 64-70.
- Carcaillet C, Bergeron Y, Richard PJH, Frechette B, Gauthier S & Prairie YT 2001 ‘Change of fire frequency in the eastern Canadian boreal forests during the Holocene: does vegetation composition or climate trigger the fire regime?’ *Journal of Ecology*, vol. 89, p. 930-946.
- Carr GW 1996, ‘Salix,’ in Walsh NG & Entwistle TJ (Eds.), *Flora of Victoria*, Vol. 3, Inkata Press, Melbourne.
- Carr, GW, Yogovic, JV & Robinson, KE 1992, *Environmental Weed Invasions in Victoria*, Department of Conservation and Environment, Vic.
- Cody WJ 1996, *Flora of the Yukon Territory*, NRC Research Press, Ottawa.
- Cremer KW 1995, *Willow Identification for river management in Australia*, CSIRO Division of Forestry, Orange, NSW.
- Cremer K 1999 *Willow Management for Australian Rivers* CSIRO Forestry and Forest Products, Kingston ACT.
- Cremer, K 2001 *Exterminate Wild Pussy Willows and its most invasive relative,s* CSIRO Forestry and Forest Products, Kingston ACT.
- Cremer K 2003 ‘Introduced willows can become invasive pests in Australia,’ *Biodiversity*, Vol. 4(4), p. 17-24.
- Cremer K, Van Kraayenoord C, Parker N & Streatfield S 1995, ‘Willows spreading by seed,’ *Australian Journal of Soil and Water Conservation*, Vol 8 (4), p. 18-27.
- Crouch RJ & Honeyman MN 1986, ‘The relative slat tolerance of willow cuttings,’ *Journal of Soil Conservation*, vol 42(2), p. 103-104.
- Davis PH 1982, *Flora of Turkey and the east Aegean Islands*, Vol. 7, Edinburgh Uni Press, Edinburgh.
- Davison RM 1965, ‘Some properties of a plant growth inhibitor present in xylem sap of woody species,’ *Australian Journal of Biological Sciences*, vol. 18(3), p. 475-486.

Invasiveness Assessment Record

Scientific name: *Salix nigra*

Common Name: Willows

Fircks HA von, Daurin A (ed.), Junttila O (ed.), Nilsen J 1985 'Frost hardiness of fast-growing *Salix* species,' *Plant production in the north. Proceeding from 'Plant adaptation workshop,'* Norway.

Gilliver K 1947, 'The effect of plant extracts on the germination of the conidia of *Venturia inaequalis*,' *Ann. Appl. Biol.*, vol. 34(1), p. 136-143.

Griffiths M 1992, *The New Royal Horticultural Society dictionary of gardening*, vol. 4, Macmillan, London.

Haines A 2004 *Salix myrcoides (bayberry willow) Conservation and Research Plan for New England*, New England Flower Society, Framingham, Massachusetts, USA.

Henderson L 1991 'Alien invasive *Salix* spp. (willows) in the grassland biome of South Africa,' *South African Forestry Journal*, vol. 157, p. 91-95.

Hitchcock CL & Cronquist A 1964, *Vascular Plants of the Pacific Northwest (Part 2)*, University of Washington Press, Seattle & London.

Howard RA 1988, *Flora of the Lesser Antilles*, Vol. 4, Arnold Arboretum, Harvard Uni, Jamaica Plain, Massachusetts.

Holm L et al 1979, *A geographical atlas of world weeds*, Wiley, New York.

Koul VK, Raina A, Dhanna YP, Tickoo ML & Singh 1991, 'Evaluation of allelopathic influence of certain farm grown tree species on rice (*Oryza sativa* L. c.v. PC 19),' *Indian Journal of Forestr*, vol. 14(1), p. 54-57.

Ladson A, Gerrish G, Carr G, Thexton E 1997, *Willows Along Victorian Waterways*, Waterways Unit, Department of Natural Resources and Environment, Vic, Australia.

Maloney RF, Keedwell, RJ, Wells NJ, Reergen AL & Nilsson RG 1999, 'Effect of willow removal on habitat use by five birds of braided rivers, MrKenzie Basin, New Zealand, *New Zealand Journal of Ecology*, Vol. 23, P. 53-60.

Meikle RD 1984, *Willows and Poplars of Great Britain and Ireland*, Botanical Society of the British Isles, London.

Munz PA & Keck DD 1963, *A California Flora*, University of California Press, Berkley & LA.

Newsholme C 1992, *Willows: The genus Salix*, Tumber Press, Portland & Oregon.

Ottenbreit KA & Staniforth JR 1992, 'Life cycle and age structure of ramets in an expanding population of *Salix exigua* (sandbar willow),' *Canadian Journal of Botany*, vol. 70(6), p. 1141-1146.

Purtle C, Stelling F, Martin D, Grossman T, Frankenberg J, Campbell S & Dwyer C 2001a *Willow Identification Guide*, Department of Land and Water Conservation, NSW.

Purtle C, Stelling F, Martin D, Grossman T, Frankenberg J, Campbell S & Dwyer C 2001b *Willows along watercourses: an introduction*, Department of Land and Water Conservation, NSW.

Purtle C, Stelling F, Martin D, Grossman T, Frankenberg J, Campbell S & Dwyer C 2001c Department of Land and Water Conservation, NSW.

Shafroth PB, Scott ML & Friedman JM 1994, 'Establishment, sex structure & breeding system of an exotic riparian willow, *Salix x rubens*,' *American Midland Naturalist*, vol. 132, p. 159-172.

Spencer R 1997, *Horticultural Flora of South-Eastern Australia*, vol. 2, UNSW Press, Australia.

Strutek M, Bauer V, Klimes L & Pinosova J 1988, 'Ecology of economically important plants in the river Luznice floodplain,' *Sbornik Vysoka Skola Zemedelska*, Vol. 5(2), p. 105-118.

Standley PC & Steyermark JA 1958, *Flora of Guatemala*, Vol. 24, *Chicago Natural History Museum*, USA.

Swift CE 1997, *Colorado State University Cooperative Extension*, Colorado State University, viewed: 15/02/2006, www.colostate.edu/Depts/CoopExt/TRA/PLANTS/stable.html.

Tutin TG 1993, *Flora Europaea*, University Press, Cambridge.

Uchytel, RJ 1989, Fire Effects Information System, U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory, viewed: 10/01/2000, <http://www.fs.fed.us/database/feis/plants/tree/salex/all.html>.

Voss EG 1972, *Michigan Flora: A guide to the identification and occurrence of the native and naturalized seed plants of the state*, Crabrook Institute of Science, University of Michigan Herbarium, Michigan.

Walters SM et al (eds) 1989, *The European Garden Flora*, Cambridge University Press, UK.

Invasiveness Assessment Record

Scientific name: *Salix nigra*

Common Name: Willows

Webb, Sykes & Garnock-Jones, 1988 CJ, Sykes WR, Garnock-Jones PJ 1988, *Flora of New Zealand*, vo.l. 4, Manaaki Whenua Press, NZ

Zallar S nd, *Botanical Characteristics of the Willows*, Soil Conservation Authority, Kew.

S. cinerea, S. fragilis, S. x rubens & S. nigra are identified by Ladson et al as outstandingly invasive because of their biology and ecology, specifically their reproductive ability.

Revisions

Date	Revised by	Revision

Present distribution of *Salix nigra* in Victoria

Scientific name: *Salix nigra* Marsh.

Common name(s): black willow

Status:

Habitat:

'Streams in pastoral country ... openings in pine and eucalypt forest' (Cremer 1999). Offstream wetlands (Ladson *et al* 1997).



Potential distribution of *Salix nigra* in Victoria

Scientific name: *Salix nigra* Marsh.

Common name(s): black willow

Status:

Habitat:

'Streams in pastoral country ... openings in pine and eucalypt forest' (Cremer 1999). Offstream wetlands (Ladson *et al* 1997).

Potential distribution produced from CLIMATE modelling refined by applying suitable landuse and vegetation type overlays with CMA boundaries

MAP OVERLAYS USED.

Land Use:

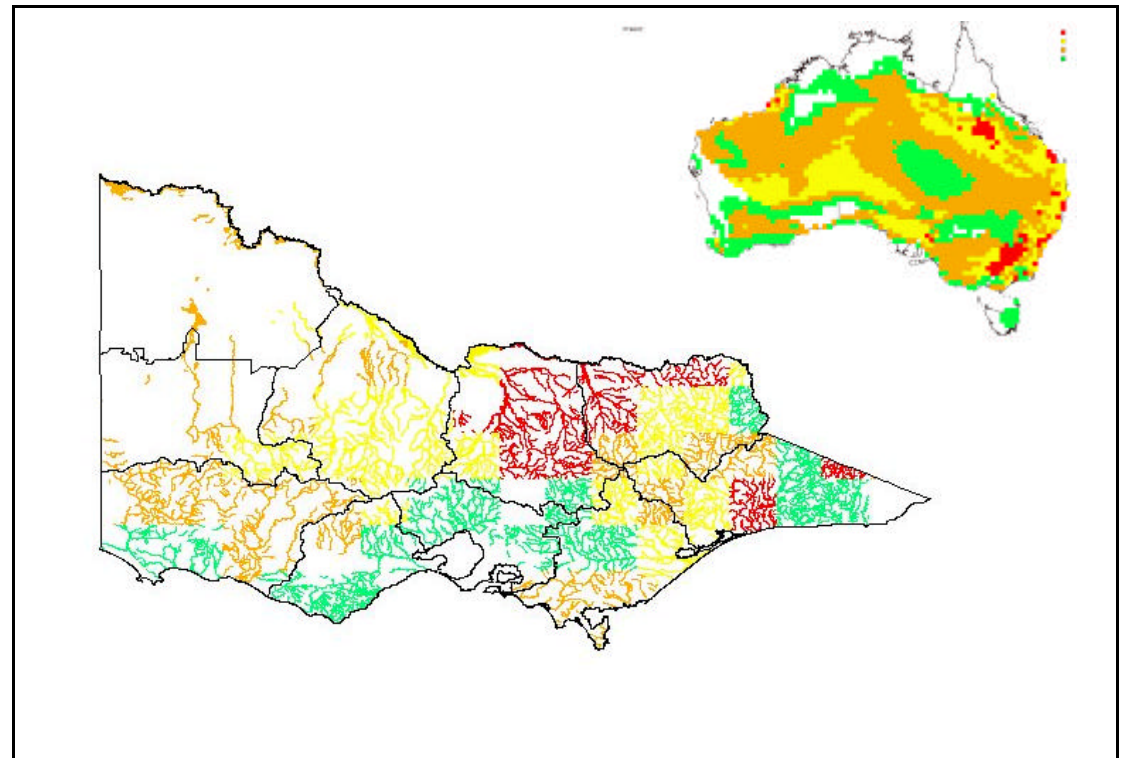
Broad vegetation types

Swamp scrub; riverine grassy woodland; riparian forest

Colours indicate possibility of *Salix nigra* infesting these areas.

Red	= Very high	Yellow	= High
Orange	= Medium	Green	= Likely

In the non-coloured areas the plant is unlikely to establish as the climate, soil or landuse is not presently suitable.



Impact Assessment Record

Scientific Name: *Salix nigra*

Common name: Willows

QUESTION	COMMENTS	RATING	CONFIDENCE
Social			
1. Restrict human access?	<i>S. nigra</i> is able to grow in the middle of streams (Ladson et al, 1997) and has roots that encroach into streams, trapping silt and reducing channel capacity and can create a shallow stream (Cremer, 1995) that boats.	H	MH
2. Reduce tourism?	<i>S. nigra</i> is able to grow in the middle of streams (Ladson et al, 1997) and has roots that encroach into streams, trapping silt and reducing channel capacity that can create a shallow stream (Cremer, 1995) that can block the passage of boats and swimmers can no longer use.	H	MH
3. Injurious to people?	No reference to human injury found in any reference. Toxicity rated as 'none' for the species summarised in the USDA Plants Database (2006) including <i>S. purpurea</i> , <i>S. exigua</i> , <i>S. nigra</i> , <i>S. x sepulcralis</i> , <i>S. alba</i> . Presume no toxicity for any <i>Salix</i> .	L	MH
4. Damage to cultural sites?	As semi-aquatic species, confined to stream banks or beds or moist locations (Carr, 1996; Carr et al, 1992; Cody, 1996; Davis, 1982; Howard, 1988; Ladson et al, 1997; Maloney et al, 1999; Munz, 1963; Voss, 1972; Webb, Sykes & Garnock-Jones, 1988) willows are unlikely to grow near enough to cause structural or visual damage to cultural sites. However, during floods, senescent trees can drop large branches or trunks into waterways and a build up of material behind these snags can destroy bridges (ARMCANZ, 2001). Major damage to buildings can occur when streams change route because they have become clogged with mats of willow roots. A Tasmanian Landcare group was formed in response to flooded homes, the cause of which was attributed to stream blockages by willow roots encroaching into streams (Sarah Holland-Clift pers. comm.).	H	MH
Abiotic			
5. Impact flow?	<i>S. nigra</i> have extensive roots, which can grow out into the stream (Cremer, 1995) "trapping silt and layering new roots over the top of the old ones...creating a broad shallow stream" (Purtle et al, 2001b).	H	MH
6. Impact water quality?	As deciduous plants (Carr, 1996), all shrub and tree willows have mass autumn leaf fall, which leads to decreased oxygen levels (Ladson et al, 1997). Intense shading by willows, which tend to have more dense canopies than native species decreases water temperature (Ladson et al, 1997).	H	MH
7. Increase soil erosion?	"Willows encroaching into the centre of streams interrupt the flow of water which results in stream flows being directed into watercourse banks, causing erosion. In severe cases, willows can create complete blockages, causing the stream to change course (Purtle, 2001b). <i>S. nigra</i> are capable of encroaching into streams (Cremer, 1999).	H	MH
8. Reduce biomass?	As woody plants that can form dense thickets, or large shrubs or trees (Carr, 1996), willows are capable of increasing biomass where they replace lower or less dense vegetation as they commonly do in disturbed sites (Cremer, 1999).	L	MH

Impact Assessment Record

Scientific Name: *Salix nigra*

Common name: Willows

QUESTION	COMMENTS	RATING	CONFIDENCE
9. Change fire regime?	Willows are low flammable/combustible trees (Carcaillet et al, 2001), likely to greatly change the frequency and intensity of fire risk.	H	H
Community Habitat			
10. Impact on composition (a) high value EVC	Basin= East Gippsland- Cann River East Branch (ISC= Excellent); CMA= East Gippsland; CLIMATE=VH. For willows in general, their “dense shade and mat-forming willow roots suppress and kill indigenous understorey” (Purtle et al, 2001b). Potential for major displacement of dominant species in a specific layer.	MH	MH
(b) medium value EVC	All Victorian waterbodies are assumed to be high value EVCs.	L	H
(c) low value EVC	All Victorian waterbodies are assumed to be high value EVCs.	L	H
11. Impact on structure?	For willow species in general , their “dense shade and mat-forming willow roots suppress and kill indigenous understorey” (Purtle et al, 2001b).	MH	MH
12. Effect on threatened flora?	No information found.	MH	L
Fauna			
13. Effect on threatened fauna?	No information found.	MH	L
14. Effect on non-threatened fauna?	Intense shading decreases primary production in waterways, impacting on invertebrates and fish (Ladson et al, 1997). Reduce indigenous vegetation which would otherwise provide habitat (especially tree hollows) and pollen and nectar food sources (Ladson, 1997) “Dense shade and mat-forming willow roots suppress and kill indigenous understorey [which is] important habitat for insects, birds and mammals. Bare banks beneath willows provide little protection for frogs, water rats, snakes, lizards and other fauna. Willows do not provide nectar for native birds...Willows also have few hollows, important habitat for over half of our woodland birds and mammals” (Purtle et al, 2001b). Reduction in habitat for fauna, leading to reduction in numbers of individuals but not to local extinction.	MH	MH
15. Benefits fauna?	Possums graze and defoliate isolated trees (ARMCANZ, 2001). <i>S. nigra</i> is palatable to some mammals (Uchytel, 1989). Willows are capable at most of providing some assistance as either food or shelter to desirable species.	MH	MH

Impact Assessment Record

Scientific Name: *Salix nigra*

Common name: Willows

QUESTION	COMMENTS	RATING	CONFIDENCE
16. Injurious to fauna?	No reference to animal injury found in any reference.	L	H
Pest Animal			
17. Food source to pests?	Rodents eat the buds and bark of <i>S. nigra</i> (Uchytel, 1989).	ML	MH
18. Provides harbor?	<i>S. nigra</i> tend to have single trunks (Cremer, 1995), making them unlikely to harbor vermin as they don't tend to form thickets.	L	MH
Agriculture			
19. Impact yield?	Species present as agricultural weeds: <i>S. alba</i> in NZ and USA, <i>S. babylonica</i> and <i>S. cinerea</i> in NZ, <i>S. exigua</i> in USA, <i>S. nigra</i> in USA and <i>S. fragilis</i> is a principal agricultural weed in NZ (Holm et al, 1979). As willows are associated with waterways and not recorded as invaders of pasture or crops, their ability to form dense thickets that impede access to waterways for irrigation is likely to be the only impact they have on agriculture. Willow root mats reduce access to flowing water for irrigation purposes (Sarah Holland-Clift pers. comm.). <i>S. nigra</i> is able to grow instream (Cremer, 1999), which may reduce access to waterways for irrigation include. They are likely to have a minor impact on the quantity of produce.	ML	MH
20. Impact quality?	Generally willows are valued for shade and browsing for livestock (Besaans, 1995).	L	MH
21. Affect land value?	"Fibrous willow roots and dense willow foliage trap large amounts of silt which can decrease channel capacity, exacerbate flooding and change flood patterns...Willows encroaching into the centre of streams interrupt the flow of water which results in stream flows being directed into watercourse banks, causing erosion." (Purtle, 2001b). Whilst risk of floods and erosion may cause decrease in land value in some incidences, with a state wide view, this is likely to be negligible.	L	MH
22. Change land use?	Willows are associated with waterways and not recorded as invaders of pasture or crops in the extensive literature. Whilst control may be required (see Q. 23) there is little risk that land use would need to change as a consequence of their invasion of agricultural land.	L	H
23. Increase harvest costs?	Some willow control to maintain waterways for irrigation may increase harvest costs by a minor amount. This is likely to be true for <i>S. nigra</i> (Cremer, 1999). In the Jerilderie area 80% of farmers are donating a rebate to fund a project manager for willows in Yanco Creek, because their root mats reduce access to creek water for irrigation (Sarah Holland-Clift).	MH	MH
24. Disease host/vector?	Not found in the extensive literature.	L	H

Impact Assessment Record

Scientific Name: *Salix nigra*

Common name: Willows

References cited:

- Agriculture & Resource Management Council of Australia & New Zealand (ARMCANZ) 2001, *Weeds of National Significance Willow (Salix taxa, excluding S. babylonica, S. x calodendron and S. x reichardtii) Strategic Plan*, National Weeds Strategy Executive Committee, Launceston.
- Aiken SG, Dallwitz MJ, Consaul LL, McJanet CL, Gillespie LJ, Boles RL, Argus GW, Gillett JM, Scott PJ, Elven R, LeBlanc MC, Brysting AK & Solstad H 1999, *Flora of the Canadian Arctic Archipelago: Descriptions, Illustration, Identification, and Information Retrieval*, Memorial University of Newfoundland, viewed: 16/02/2006, www.mun.ca/biology/delta/arctic/_ca/www/wl.htm.
- Bailey LH & Bailey LZ 1976 *Hortus Third*, Macmillan, New York & London.
- Besaans (ed.) 1995, *Plant Protection News* vol. 47, pp. 20-24.
- Carcaillet C, Bergeron Y, Richard PJH, Frechette B, Gauthier S & Prairie YT 2001 'Change of fire frequency in the eastern Canadian boreal forests during the Holocene: does vegetation composition or climate trigger the fire regime?' *Journal of Ecology*, vol. 89, p. 930-946.
- Carr GW 1996, 'Salix,' in Walsh NG & Entwisle TJ (Eds.), *Flora of Victoria*, Vol. 3, Inkata Press, Melbourne.
- Carr, GW, Yogovic, JV & Robinson, KE 1992, *Environmental Weed Invasions in Victoria*, Department of Conservation and Environment, Vic.
- Cody WJ 1996, *Flora of the Yukon Territory*, NRC Research Press, Ottawa.
- Cremer KW 1995, *Willow Identification for river management in Australia*, CSIRO Division of Forestry, Orange, NSW.
- Cremer K 1999 *Willow Management for Australian Rivers* CSIRO Forestry and Forest Products, Kingston ACT.
- Cremer, K 2001 *Exterminate Wild Pussy Willows and its most invasive relative,s* CSIRO Forestry and Forest Products, Kingston ACT.
- Crouch RJ & Honeyman MN 1986, 'The relative salt tolerance of willow cuttings,' *Journal of Soil Conservation*, vol 42(2), p. 103-104.
- Davis PH 1982, *Flora of Turkey and the east Aegean Islands, Vol. 7*, Edinburgh Uni Press, Edinburgh.
- Fircks HA von, Daurin A (ed.), Junttila O (ed.), Nilsen J 1985 'Frost hardiness of fast-growing *Salix* species,' *Plant production in the north. Proceeding from 'Plant adaptation workshop*, ' Norway.
- Haines A 2004 *Salix myrcoides (bayberry willow) Conservation and Research Plan for New England*, New England Flower Society, Framingham, Massachusetts, USA.
- Henderson L 1991 'Alien invasive *Salix* spp. (willows) in the grassland biome of South Africa,' *South African Forestry Journal*, vol. 157, p. 91-95.
- Hitchcock CL & Cronquist A 1964, *Vascular Plants of the Pacific Northwest (Part 2)*, University of Washington Press, Seattle & London.
- Howard RA 1988, *Flora of the Lesser Antilles*, Vol. 4, Arnold Arboretum, Harvard Uni, Jamaica Plain, Massachusetts.
- Holm L et al 1979, *A geographical atlas of world weeds*, Wiley, New York.
- Kennedy SA, Ganf FF & Walker KF 2003, 'Does salinity influence the distribution of exotic willows (*Salix* spp.) along the Lower River Murray?' *Marine and Freshwater Research*, vol 54, p. 825-831.
- Ladson A, Gerrish G, Carr G, Thexton E 1997, *Willows Along Victorian Waterways*, Waterways Unit, Department of Natural Resources and Environment, Vic, Australia.
- Maloney RF, Keedwell, RJ, Wells NJ, Reergen AL & Nilsson RG 1999, 'Effect of willow removal on habitat use by five birds of braided rivers, MrKenzie Basin, New Zealand, *New Zealand Journal of Ecology*, Vol. 23, P. 53-60.
- Meikle RD 1984, *Willows and Poplars of Great Britain and Ireland*, Botanical Society of the British Isles, London.
- Munz PA & Keck DD 1963, *A California Flora*, University of California Press, Berkley & LA.
- Muyt A 2001, *Bush invaders of South-East Australia*, RG and FJ Richardson, Meredith, Vic.
- Newsholme C 1992, *Willows: The genus Salix*, Tumber Press, Portland & Oregon.

Impact Assessment Record

Scientific Name: *Salix nigra*

Common name: Willows

- Purtle C, Stelling F, Martin D, Grossman T, Frankenberg J, Campbell S & Dwyer C 2001a *Willow Identification Guide*, Department of Land and Water Conservation,
- Purtle C, Stelling F, Martin D, Grossman T, Frankenberg J, Campbell S & Dwyer C 2001b *Willows along watercourses: an introduction*, Department of Land and Water Conservation,
- Purtle C, Stelling F, Martin D, Grossman T, Frankenberg J, Campbell S & Dwyer C 2001c Department of Land and Water Conservation,
- Shafroth PB, Scott ML & Friedman JM 1994, 'Establishment, sex structure & breeding system of an exotic riparian willow, *Salix x rubens*,' *American Midland Naturalist*, vol. 132, p. 159-172.
- Srutek M, Bauer V, Klimes L & Pinosova J 1988, 'Ecology of economically important plants in the river Luznice floodplain,' *Sbornik Vysoka Skola Zemedelska*, Vol. 5(2), p. 105-118.
- Standley PC & Steyermark JA 1958, *Flora of Guatemala*, Vol. 24, *Chicago Natural History Museum*, USA.
- Swift CE 1997, *Colorado State University Cooperative Extension*, Colorado State University, viewed: 15/02/2006, www.colostate.edu/Depts/CoopExt/TRA/PLANTS/stable.html.
- Uchytel, RJ 1989, Fire Effects Information System, U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory, viewed: 16/02/2006, www.fs.fed.us/database/feis/plants/tree/salnig/all.html.
- United States Department of Agriculture (USDA) 2006 USDA Plants Database, Washington, viewed: 16/02/2006, http://plants.nrcs.usda.gov/cgi_bin/topics.cgi?earl=characteristics.html.
- Voss EG 1972, *Michigan Flora: A guide to the identification and occurrence of the native and naturalized seed plants of the state*, Crabbrook Institute of Science, University of Michigan Herbarium, Michigan.
- Walters SM et al (eds) 1989, *The European Garden Flora*, Cambridge University Press, UK.
- Webb CJ, Sykes WR, Garnock-Jones PJ 1988, *Flora of New Zealand*, vol. 4, Manaaki Whenua Press, NZ
- Zallar S nd, *Botanical Characteristics of the Willows*, Soil Conservation Authority, Kew.

Revisions

Date	Revised by	Revision

Invasiveness Assessment Record

Scientific name: *Salix purpurea*

Common Name: Willows

QUESTION	COMMENTS	RATING	CONFIDENCE
Establishment			
1. Germination requirements?	<i>S. purpurea</i> generally invade as seedlings (Carr, 1996) and as such are “virtually restricted to bare sediment that is wet for weeks or months following seed shed [and] seedlings need much light” which is predicted to occur “in most streams at intervals of about 5 to 20 years” (Cremer, 1999).	ML	MH
2. Establishment requirements?	<i>S. purpurea</i> can be “grown in deep shade” (Newsholme, 1992).	H	MH
3. How much disturbance is required?	<i>S. purpurea</i> generally invade as seedlings (Carr, 1996) and as such “virtually restricted to bare sediment that is wet for weeks or months following seed shed [and] seedlings need much light” (Cremer, 1999).	L	MH
Growth/Competitive			
4. Life form?	Semi-aquatic- All willows are described as growing on the banks of water courses or in moist locations. <i>S. purpurea</i> grows on streamsides (Webb, Sykes & Garnock-Jones, 1988).	H	MH
5. Allelopathic properties?	Of the naturalised willows in Australia, allelopathic compounds have been demonstrated in <i>S. rubra</i> (Bokarev, Kefeli & Kapeljusnikova, 1966), <i>S. babylonica</i> (Koul et al, 1991), <i>S. fragilis</i> (Davison, 1965), <i>S. viminalis</i> (Bowen & Hoad, 1968), <i>S. alba</i> (Banzhaf et al, 1983) and <i>S. purpurea</i> (Gilliver, 1947).	MH	H
6. Tolerates herb pressure?	<i>S. purpurea</i> are relished by stock, but able to recover unless heavily grazed (Dickerson, 2002).	MH	MH
7. Normal growth rate?	“ <i>Salix</i> are fast growing trees or shrubs, rarely prostrate” (Spencer, 1997). Where growth rates are described, tree and shrub forms of <i>Salix</i> are recorded as vigorous or fast growing, eg. <i>S. alba</i> (Spencer, 1997), <i>S. glaucophylloides</i> (Newsholme, 1992), <i>S. nigra</i> (Cremer, 1995), <i>S. purpurea</i> (Webb, Sykes & Garnock-Jones, 1988) and <i>S. x rubens</i> (Meikle).	H	MH

Invasiveness Assessment Record

Scientific name: *Salix purpurea*

Common Name: Willows

QUESTION	COMMENTS	RATING	CONFIDENCE
8. Stress tolerance to frost, drought, w/logg, sal. etc?	FIRE “If a tree is completely girdled by fire at ground level it may die without coppicing...however young trees tend to sprout from the buried portion of their stem” (Cremer, 1999), indicating some fire tolerance in tree and shrub willows in general. FROST All tree and shrub species (except <i>S. humboldtiana</i>) in this study are recorded as tolerating USDA hardiness zones of between 1 and 6 (average minimum temperatures between –46C and –17C) (Bailey & Bailey, 1976, Griffiths, 1992). <i>S. humboldtiana</i> is susceptible to frost (Newsholme, 1992). DROUGHT All willows are described as growing on the banks or in the riverbeds of water courses or in moist locations (Carr, 1996; Carr et. al, 1992; Cody, 1996; Davis, 1982; Howard, 1988; Ladson, et al, 1997; Maloney et al, 1999; Munz, 1963; Voss, 1972; Webb, Sykes & Garnock-Jones, 1988) suggesting a low drought tolerance; and only few species (<i>S. cinerea</i> and <i>S. exigua</i>) can also establish on drier soil (but are not necessarily drought tolerant), with <i>S. purpurea</i> alone tolerating extremely dry, sandy soils (Newsholme, 1992). WATERLOGGING Those species able to grow in riverbeds must have high tolerance of waterlogging (<i>S. exigua</i>, Cody, 1996; <i>S. fragilis</i>, Maloney et al, 1999; <i>S. alba</i>, <i>S.x rubens</i>, and <i>S. viminalis</i>; Webb, Sykes & Garnock-Jones, 1988) and also <i>S. cinerea</i> (Cremer, 1999). SALINITY <i>S. alba</i> is “the most tolerant of all willows to brackish water” (Zallar). <i>S. cinerea</i> “tolerates salt-laden air” (Newsholme, 1992), <i>S. fragilis</i>, <i>S. matsudana</i> & <i>S. seringeana</i> tolerate high levels of salinity (Crouch & Honeyman, 1986). <i>S. nigra</i> has moderately high tolerance of salt (Swift, 1997) and <i>S. purpurea</i> shows “considerable tolerance for salt water” (Newsholme, 1992). <i>S. purpurea</i> Fire-some, Frost-yes, Drought-some, waterlogging-no, salinity-yes	MH	MH
Reproduction			
9. Reproductive system	<i>S. purpurea</i> “Vegetative reproduction is limited; abundant seed is set in some locations” (Carr, 1996). Capable of reproducing both vegetatively and by seed	H	MH
10. Number of propagules produced?	“A large crown would produce over 500 000 seeds (Cremer, 1999). Seeds numerous, very small, each with a tuft of long hairs (Tutin, 1993).	H	MH
11. Propagule longevity?	“Willow seed is very short-lived” with longer-lived species recorded at surviving 8-10 weeks (Cremer, 1999).	L	MH
12. Reproductive period?	Following reproductive maturity “flowering tends to be ample and to occur every year” (Cremer, 1999). <i>S. cinerea</i> “stands are mostly monoculture excluding 97% of sunlight and most other species” (Cremer, 1999). The oldest stem <i>S. exigua</i> in this study was 31 years (Ottenbreit & Staniforth, 1992). An old <i>S. fragilis</i> tree was observed to 130 years (Meikle, 1984).	H	MH

Invasiveness Assessment Record

Scientific name: *Salix purpurea*

Common Name: Willows

QUESTION	COMMENTS	RATING	CONFIDENCE
13. Time to reproductive maturity?	“Flowering and the production of viable seed may begin two to three years after germination, provided the plant is at least 1m tall if it is a shrub willow, or 2m tall if it is a tree willow...In some taxa (eg. <i>S. alba</i>) flowering tends to begin at larger sizes” (Cremer, 1999), which is probably still within 5 years. For plants that have reproduced vegetatively, this may be reduced, as in <i>S. nigra</i>, observed flowering on cuttings produced from < 1 year old growth (Crouch & Honeyman, 1986).	ML	MH
Dispersal			
14. Number of mechanisms?	Vegetative propagules and seed spread by water. “Seed is easily carried by wind” (Cremer, 1999).	H	MH
15. How far do they disperse?	“Seed is easily carried by wind for more than 1km and some travels for up to 50km or even 100km (Cremer, 1999) for species that commonly reproduce by seed such as <i>S. nigra</i> (ARMCANZ, 2001).	H	MH

References cited:

- Agriculture & Resource Management Council of Australia & New Zealand (ARMCANZ) 2001, *Weeds of National Significance Willow (Salix taxa, excluding S. babylonica, S. x calodendron and S. x reichardtii) Strategic Plan*, National Weeds Strategy Executive Committee, Launceston.
- Bahnzaf R, Kranzle M, Muhle H & Winkler S 1983, ‘Effect of leaf leachates on nitrogen mineralization [German],’ *Verhandlungen der Gesellschaft fur Okologie*, vol. 10, p. 63-70.
- Bailey LH & Bailey LZ 1976 *Hortus Third*, Macmillan, New York & London.
- Besaans (ed.) 1995, *Plant Protection News* vol. 47, pp. 20-24.
- Bokarev KS, Kefeli VI & Kapeljusnikova LM 1966, ‘Chemical and physiological properties of natural inhibitors from *Salix rubra* [Russian],’ *Fizio. Rast.*, Vol. 13(2), p. 274-282.
- Bowen MR & Hoad GV 1968, ‘Inhibitor content of phloem and xylem sap obtained from willow (*Salix viminalis*) entering dormancy,’ *Planta.*, vol 81(1), p. 64-70.
- Carcaillet C, Bergeron Y, Richard PJH, Frechette B, Gauthier S & Prairie YT 2001 ‘Change of fire frequency in the eastern Canadian boreal forests during the Holocene: does vegetation composition or climate trigger the fire regime?’ *Journal of Ecology*, vol. 89, p. 930-946.
- Carr GW 1996, ‘Salix,’ in Walsh NG & Entwistle TJ (Eds.), *Flora of Victoria*, Vol. 3, Inkata Press, Melbourne.
- Carr, GW, Yogovic, JV & Robinson, KE 1992, *Environmental Weed Invasions in Victoria*, Department of Conservation and Environment, Vic.
- Cody WJ 1996, *Flora of the Yukon Territory*, NRC Research Press, Ottawa.
- Cremer KW 1995, *Willow Identification for river management in Australia*, CSIRO Division of Forestry, Orange, NSW.
- Cremer K 1999 *Willow Management for Australian Rivers* CSIRO Forestry and Forest Products, Kingston ACT.
- Cremer, K 2001 *Exterminate Wild Pussy Willows and its most invasive relative,s* CSIRO Forestry and Forest Products, Kingston ACT.
- Cremer K 2003 ‘Introduced willows can become invasive pests in Australia,’ *Biodiversity*, Vol. 4(4), p. 17-24.
- Cremer K, Van Kraayenoord C, Parker N & Streatfield S 1995, ‘Willows spreading by seed,’ *Australian Journal of Soil and Water Conservation*, Vol 8 (4), p. 18-27.
- Crouch RJ & Honeyman MN 1986, ‘The relative slat tolerance of willow cuttings,’ *Journal of Soil Conservation*, vol 42(2), p. 103-104.
- Davis PH 1982, *Flora of Turkey and the east Aegean Islands*, Vol. 7, Edinburgh Uni Press, Edinburgh.
- Davison RM 1965, ‘Some properties of a plant growth inhibitor present in xylem sap of woody species,’ *Australian Journal of Biological Sciences*, vol. 18(3), p. 475-486.

Invasiveness Assessment Record

Scientific name: *Salix purpurea*

Common Name: Willows

Fircks HA von, Daurin A (ed.), Junttila O (ed.), Nilsen J 1985 'Frost hardiness of fast-growing *Salix* species,' *Plant production in the north. Proceeding from 'Plant adaptation workshop,'* Norway.

Gilliver K 1947, 'The effect of plant extracts on the germination of the conidia of *Venturia inaequalis*,' *Ann. Appl. Biol.*, vol. 34(1), p. 136-143.

Griffiths M 1992, *The New Royal Horticultural Society dictionary of gardening*, vol. 4, Macmillan, London.

Haines A 2004 *Salix myrcoides (bayberry willow) Conservation and Research Plan for New England*, New England Flower Society, Framingham, Massachusetts, USA.

Henderson L 1991 'Alien invasive *Salix* spp. (willows) in the grassland biome of South Africa,' *South African Forestry Journal*, vol. 157, p. 91-95.

Hitchcock CL & Cronquist A 1964, *Vascular Plants of the Pacific Northwest (Part 2)*, University of Washington Press, Seattle & London.

Howard RA 1988, *Flora of the Lesser Antilles*, Vol. 4, Arnold Arboretum, Harvard Uni, Jamaica Plain, Massachusetts.

Holm L et al 1979, *A geographical atlas of world weeds*, Wiley, New York.

Koul VK, Raina A, Dhanna YP, Tickoo ML & Singh 1991, 'Evaluation of allelopathic influence of certain farm grown tree species on rice (*Oryza sativa* L. c.v. PC 19),' *Indian Journal of Forestr*, vol. 14(1), p. 54-57.

Ladson A, Gerrish G, Carr G, Thexton E 1997, *Willows Along Victorian Waterways*, Waterways Unit, Department of Natural Resources and Environment, Vic, Australia.

Maloney RF, Keedwell, RJ, Wells NJ, Reergen AL & Nilsson RG 1999, 'Effect of willow removal on habitat use by five birds of braided rivers, MrKenzie Basin, New Zealand, *New Zealand Journal of Ecology*, Vol. 23, P. 53-60.

Meikle RD 1984, *Willows and Poplars of Great Britain and Ireland*, Botanical Society of the British Isles, London.

Munz PA & Keck DD 1963, *A California Flora*, University of California Press, Berkeley & LA.

Newsholme C 1992, *Willows: The genus Salix*, Tumber Press, Portland & Oregon.

Ottenbreit KA & Staniforth JR 1992, 'Life cycle and age structure of ramets in an expanding population of *Salix exigua* (sandbar willow),' *Canadian Journal of Botany*, vol. 70(6), p. 1141-1146.

Purtle C, Stelling F, Martin D, Grossman T, Frankenberg J, Campbell S & Dwyer C 2001a *Willow Identification Guide*, Department of Land and Water Conservation, NSW.

Purtle C, Stelling F, Martin D, Grossman T, Frankenberg J, Campbell S & Dwyer C 2001b *Willows along watercourses: an introduction*, Department of Land and Water Conservation, NSW.

Purtle C, Stelling F, Martin D, Grossman T, Frankenberg J, Campbell S & Dwyer C 2001c Department of Land and Water Conservation, NSW.

Shafroth PB, Scott ML & Friedman JM 1994, 'Establishment, sex structure & breeding system of an exotic riparian willow, *Salix x rubens*,' *American Midland Naturalist*, vol. 132, p. 159-172.

Spencer R 1997, *Horticultural Flora of South-Eastern Australia*, vol. 2, UNSW Press, Australia.

Strutek M, Bauer V, Klimes L & Pinosova J 1988, 'Ecology of economically important plants in the river Luznice floodplain,' *Sbornik Vysoka Skola Zemedelska*, Vol. 5(2), p. 105-118.

Standley PC & Steyermark JA 1958, *Flora of Guatemala*, Vol. 24, *Chicago Natural History Museum*, USA.

Swift CE 1997, *Colorado State University Cooperative Extension*, Colorado State University, viewed: 15/02/2006, www.colostate.edu/Depts/CoopExt/TRA/PLANTS/stable.html.

Tutin TG 1993, *Flora Europaea*, University Press, Cambridge.

Uchytel, RJ 1989, Fire Effects Information System, U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory, viewed: 10/01/2000, <http://www.fs.fed.us/database/feis/plants/tree/salex/all.html>.

Voss EG 1972, *Michigan Flora: A guide to the identification and occurrence of the native and naturalized seed plants of the state*, Crabrook Institute of Science, University of Michigan Herbarium, Michigan.

Walters SM et al (eds) 1989, *The European Garden Flora*, Cambridge University Press, UK.

Invasiveness Assessment Record

Scientific name: *Salix purpurea*

Common Name: Willows

Webb, Sykes & Garnock-Jones, 1988 CJ, Sykes WR, Garnock-Jones PJ 1988, *Flora of New Zealand*, vo.l. 4, Manaaki Whenua Press, NZ

Zallar S nd, *Botanical Characteristics of the Willows*, Soil Conservation Authority, Kew.

S. cinerea, S. fragilis, S. x rubens & S. nigra are identified by Ladson et al as outstandingly invasive because of their biology and ecology, specifically their reproductive ability.

Revisions

Date	Revised by	Revision

Present distribution of *Salix purpurea* in Victoria

Scientific name: *Salix purpurea* L.

Common name(s): purpleosier willow

Status:

Habitat:

Streamsides (Webb *et al* 1988).



Potential distribution of *Salix purpurea* in Victoria

Scientific name: *Salix purpurea* L.

Common name(s): purpleosier willow

Status:

Habitat:

Streamsides (Webb *et al* 1988).

Potential distribution produced from CLIMATE modelling refined by applying suitable landuse and vegetation type overlays with CMA boundaries

MAP OVERLAYS USED.

Land Use:

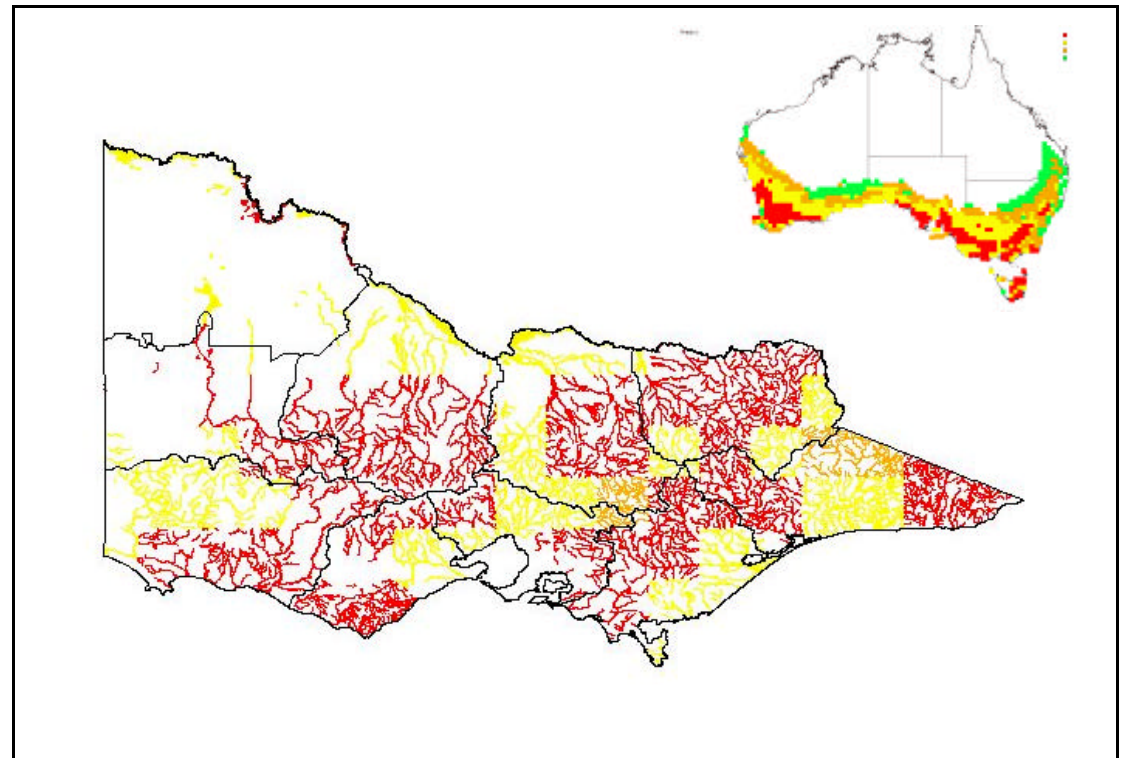
Broad vegetation types

Swamp scrub; riverine grassy woodland; riparian forest

Colours indicate possibility of *Salix purpurea* infesting these areas.

■ Red	= Very high	■ Yellow	= High
■ Orange	= Medium	■ Green	= Likely

In the non-coloured areas the plant is unlikely to establish as the climate, soil or landuse is not presently suitable.



Impact Assessment Record

Scientific Name: *Salix purpurea*

Common name: Willows

QUESTION	COMMENTS	RATING	CONFIDENCE
Social			
1. Restrict human access?	Willows can form dense thickets several metres thick, with densely spaced stems (FEIS, 2000) that could be major impediments to access waterways. <i>S. purpurea</i> is a thicket-forming species (Cremer, 1999). <i>S. purpurea</i> has extensive roots, which can grow out into the stream (Cremer, 1995) “trapping silt and layering new roots over the top of the old ones...creating a broad shallow stream” (Ladson et al, 1997) that can block the passage of boats.	H	MH
2. Reduce tourism?	<i>S. purpurea</i> has roots that can encroach into streams (Cremer, 1995), trapping silt and reducing channel capacity to create a shallow stream that boats and swimmers can no longer use.	H	
3. Injurious to people?	No reference to human injury found in any reference. Toxicity rated as ‘none’ for the species summarised in the USDA Plants Database (2006) including <i>S. purpurea</i> , <i>S. exigua</i> , <i>S. nigra</i> , <i>S. x sepulcralis</i> , <i>S. alba</i> . Presume no toxicity for any <i>Salix</i> .	L	MH
4. Damage to cultural sites?	As semi-aquatic species, confined to stream banks or beds or moist locations (Carr, 1996; Carr et al, 1992; Cody, 1996; Davis, 1982; Howard, 1988; Ladson et al, 1997; Maloney et al, 1999; Munz, 1963; Voss, 1972; Webb, Sykes & Garnock-Jones, 1988) willows are unlikely to grow near enough to cause structural or visual damage to cultural sites. However, during floods, senescent trees can drop large branches or trunks into waterways and a build up of material behind these snags can destroy bridges (ARMCANZ, 2001). Major damage to buildings can occur when streams change route because they have become clogged with mats of willow roots. A Tasmanian Landcare group was formed in response to flooded homes, the cause of which was attributed to stream blockages by willow roots encroaching into streams (Sarah Holland-Clift pers. comm.).	H	MH
Abiotic			
5. Impact flow?	<i>S. purpurea</i> has roots that can encroach into streams (Cremer, 1995), trapping silt and reducing channel capacity to create a shallow stream (Purtle et al, 2001b).	H	MH
6. Impact water quality?	As deciduous plants (Carr, 1996), all shrub and tree willows have mass autumn leaf fall, which leads to decreased oxygen levels (Ladson et al, 1997). Intense shading by willows, which tend to have more dense canopies than native species decreases water temperature (Ladson et al, 1997).	H	MH
7. Increase soil erosion?	“Willows encroaching into the centre of streams interrupt the flow of water which results in stream flows being directed into watercourse banks, causing erosion. In severe cases, willows can create complete blockages, causing the stream to change course (Purtle, 2001b). <i>S. purpurea</i> is capable of encroaching into streams (Cremer, 1999)	H	MH

Impact Assessment Record

Scientific Name: *Salix purpurea*

Common name: Willows

QUESTION	COMMENTS	RATING	CONFIDENCE
8. Reduce biomass?	As woody plants that can form dense thickets, or large shrubs or trees (Carr, 1996), willows are capable of increasing biomass where they replace lower or less dense vegetation as they commonly do in disturbed sites (Cremer, 1999).	L	MH
9. Change fire regime?	Willows are low flammable/combustible trees (Carcaillet et al, 2001), likely to greatly change the frequency and intensity of fire risk.	H	H
Community Habitat			
10. Impact on composition (a) high value EVC	Basin=East Gippsland- Cann River (ISC=Excellent); CMA=East Gippsland; CLIMATE=VH. Several suckering species have been recorded forming dense thickets that exclude sunlight and most other species, including <i>S. cinerea</i> , (Cremer, 1999) and <i>S. fragilis</i> (Henderson, 1991). <i>S. purpurea</i> is a thicket-forming species (Cremer, 1999), likely to be capable of forming monocultures excluding all other vegetation within a layer.	H	MH
(b) medium value EVC	All Victorian waterbodies are assumed to be high value EVCs.	L	H
(c) low value EVC	All Victorian waterbodies are assumed to be high value EVCs.	L	H
11. Impact on structure?	Several suckering species have been recorded forming dense thickets that exclude sunlight and most other species, including <i>S. cinerea</i> , (Cremer, 1999) and <i>S. fragilis</i> (Henderson, 1991). <i>S. purpurea</i> is a thicket-forming species (Cremer, 1999), likely to be capable of having the same major effect on all layers of native vegetation.	H	MH
12. Effect on threatened flora?	No information found.	MH	L
Fauna			
13. Effect on threatened fauna?	No information found.	MH	L
14. Effect on non-threatened fauna?	Intense shading decreases primary production in waterways, impacting on invertebrates and fish (Ladson et al, 1997). Reduce indigenous vegetation which would otherwise provide habitat (especially tree hollows) and pollen and nectar food sources (Ladson, 1997) “Dense shade and mat-forming willow roots suppress and kill indigenous understorey [which is] important habitat for insects, birds and mammals. Bare banks beneath willows provide little protection for frogs, water rats, snakes, lizards and other fauna. Willows do not provide nectar for native birds...Willows also have few hollows, important habitat for over half of our woodland birds and mammals” (Purtle et al, 2001b).	MH	MH

Impact Assessment Record

Scientific Name: *Salix purpurea*

Common name: Willows

QUESTION	COMMENTS	RATING	CONFIDENCE
	Reduction in habitat for fauna, leading to reduction in numbers of individuals but not to local extinction.		
15. Benefits fauna?	Possums graze and defoliate isolated trees (ARMCANZ, 2001). <i>S. purpurea</i> is palatable to other mammals (USDA, 2000). <i>S. exigua</i> “stands provide excellent cover for numerous wildlife species” in America (FEIS, 2000). <i>S. purpurea</i> is a thicket-forming species (Cremer, 1999), that might also provide habitat. Willows are capable at most of providing some assistance as either food or shelter to desirable species.	MH	MH
16. Injurious to fauna?	No reference to animal injury found in any reference.	L	H
Pest Animal			
17. Food source to pests?	<i>S. purpurea</i> provides a food source for rabbits (USDA, 2000).	MH	MH
18. Provides harbor?	<i>S. exigua</i> “stands provide excellent cover for numerous wildlife species” in America (FEIS, 2000). <i>S. purpurea</i> is a thicket-forming species (Cremer, 1999), that might provide harbour for foxes and rabbits.	H	MH
Agriculture			
19. Impact yield?	Species present as agricultural weeds: <i>S. alba</i> in NZ and USA, <i>S. babylonica</i> and <i>S. cinerea</i> in NZ, <i>S. exigua</i> in USA, <i>S. nigra</i> in USA and <i>S. fragilis</i> is a principal agricultural weed in NZ (Holm et al, 1979). As willows are associated with waterways and not recorded as invaders of pasture or crops, their ability to form dense thickets that impede access to waterways for irrigation is likely to be the only impact they have on agriculture. Willow root mats reduce access to flowing water for irrigation purposes (Sarah Holland-Clift pers. comm.). <i>S. purpurea</i> is a thicket-forming species (Cremer, 1999) which may reduce access to waterways for irrigation. They are likely to have a minor impact on the quantity of produce.	ML	MH

Impact Assessment Record

Scientific Name: *Salix purpurea*

Common name: Willows

QUESTION	COMMENTS	RATING	CONFIDENCE
20. Impact quality?	Generally willows are valued for shade and browsing for livestock (Besaans, 1995).	L	MH
21. Affect land value?	“Fibrous willow roots and dense willow foliage trap large amounts of silt which can decrease channel capacity, exacerbate flooding and change flood patterns...Willows encroaching into the centre of streams interrupt the flow of water which results in stream flows being directed into watercourse banks, causing erosion.” (Purtle, 2001b). Whilst risk of floods and erosion may cause decrease in land value in some incidences, with a state wide view, this is likely to be negligible.	L	MH
22. Change land use?	Willows are associated with waterways and not recorded as invaders of pasture or crops in the extensive literature. Whilst control may be required (see Q. 23) there is little risk that land use would need to change as a consequence of their invasion of agricultural land.	L	H
23. Increase harvest costs?	Some willow control to maintain waterways for irrigation may increase harvest costs by a minor amount. This is likely to be for the thicket-forming species such as <i>S. purpurea</i> (Cremer, 1999). In the Jerilderie area 80% of farmers are donating a rebate to fund a project manager for willows in Yanco Creek, because their root mats reduce access to creek water for irrigation (Sarah Holland-Clift).	MH	MH
24. Disease host/vector?	Not found in the extensive literature.	L	H

References cited:

- Agriculture & Resource Management Council of Australia & New Zealand (ARMCANZ) 2001, *Weeds of National Significance Willow (Salix taxa, excluding S. babylonica, S. x calodendron and S. x reichardtii) Strategic Plan*, National Weeds Strategy Executive Committee, Launceston.
- Aiken SG, Dallwitz MJ, Consaul LL, McJannet CL, Gillespie LJ, Boles RL, Argus GW, Gillett JM, Scott PJ, Elven R, LeBlanc MC, Brysting AK & Solstad H 1999, *Flora of the Canadian Arctic Archipelago: Descriptions, Illustration, Identification, and Information Retrieval*, Memorial University of Newfoundland, viewed: 16/02/2006, www.mun.ca/biology/delta/acrticf/_ca/ [www/wl1.htm](http://www.wl1.htm).
- Bailey LH & Bailey LZ 1976 *Hortus Third*, Macmillan, New York & London.
- Besaans (ed.) 1995, *Plant Protection News* vol. 47, pp. 20-24.
- Carcaillet C, Bergeron Y, Richard PJH, Frechette B, Gauthier S & Prairie YT 2001 ‘Change of fire frequency in the eastern Canadian boreal forests during the Holocene: does vegetation composition or climate trigger the fire regime?’ *Journal of Ecology*, vol. 89, p. 930-946.
- Carr GW 1996, ‘Salix,’ in Walsh NG & Entwistle TJ (Eds.), *Flora of Victoria*, Vol. 3, Inkata Press, Melbourne.
- Carr, GW, Yogovic, JV & Robinson, KE 1992, *Environmental Weed Invasions in Victoria*, Department of Conservation and Environment, Vic.
- Cody WJ 1996, *Flora of the Yukon Territory*, NRC Research Press, Ottawa.
- Cremer KW 1995, *Willow Identification for river management in Australia*, CSIRO Division of Forestry, Orange, NSW.
- Cremer K 1999 *Willow Management for Australian Rivers* CSIRO Forestry and Forest Products, Kingston ACT.
- Cremer, K 2001 *Exterminate Wild Pussy Willows and its most invasive relative,s* CSIRO Forestry and Forest Products, Kingston ACT.

Impact Assessment Record

Scientific Name: *Salix purpurea*

Common name: Willows

- Crouch RJ & Honeyman MN 1986, 'The relative salt tolerance of willow cuttings,' *Journal of Soil Conservation*, vol 42(2), p. 103-104.
- Davis PH 1982, *Flora of Turkey and the east Aegean Islands, Vol. 7*, Edinburgh Uni Press, Edinburgh.
- Fircks HA von, Daurin A (ed.), Junttila O (ed.), Nilsen J 1985 'Frost hardiness of fast-growing *Salix* species,' *Plant production in the north. Proceeding from 'Plant adaptation workshop*,' Norway.
- Haines A 2004 *Salix myrcoides (bayberry willow) Conservation and Research Plan for New England*, New England Flower Society, Framingham, Massachusetts, USA.
- Henderson L 1991 'Alien invasive *Salix* spp. (willows) in the grassland biome of South Africa,' *South African Forestry Journal*, vol. 157, p. 91-95.
- Hitchcock CL & Cronquist A 1964, *Vascular Plants of the Pacific Northwest (Part 2)*, University of Washington Press, Seattle & London.
- Howard RA 1988, *Flora of the Lesser Antilles*, Vol. 4, Arnold Arboretum, Harvard Uni, Jamaica Plain, Massachusetts.
- Holm L et al 1979, *A geographical atlas of world weeds*, Wiley, New York.
- Kennedy SA, Ganf FF & Walker KF 2003, 'Does salinity influence the distribution of exotic willows (*Salix* spp.) along the Lower River Murray?' *Marine and Freshwater Research*, vol 54, p. 825-831.
- Ladson A, Gerrish G, Carr G, Thexton E 1997, *Willows Along Victorian Waterways*, Waterways Unit, Department of Natural Resources and Environment, Vic, Australia.
- Maloney RF, Keedwell, RJ, Wells NJ, Reergen AL & Nilsson RG 1999, 'Effect of willow removal on habitat use by five birds of braided rivers, MrKenzie Basin, New Zealand, *New Zealand Journal of Ecology*, Vol. 23, P. 53-60.
- Meikle RD 1984, *Willows and Poplars of Great Britain and Ireland*, Botanical Society of the British Isles, London.
- Munz PA & Keck DD 1963, *A California Flora*, University of California Press, Berkley & LA.
- Muyt A 2001, *Bush invaders of South-East Australia*, RG and FJ Richardson, Meredith, Vic.
- Newsholme C 1992, *Willows: The genus Salix*, Tumber Press, Portland & Oregon.
- Purtle C, Stelling F, Martin D, Grossman T, Frankenberg J, Campbell S & Dwyer C 2001a *Willow Identification Guide*, Department of Land and Water Conservation,
- Purtle C, Stelling F, Martin D, Grossman T, Frankenberg J, Campbell S & Dwyer C 2001b *Willows along watercourses: an introduction*, Department of Land and Water Conservation,
- Purtle C, Stelling F, Martin D, Grossman T, Frankenberg J, Campbell S & Dwyer C 2001c Department of Land and Water Conservation,
- Shafroth PB, Scott ML & Friedman JM 1994, 'Establishment, sex structure & breeding system of an exotic riparian willow, *Salix x rubens*,' *American Midland Naturalist*, vol. 132, p. 159-172.
- Srutek M, Bauer V, Klimes L & Pinosova J 1988, 'Ecology of economically important plants in the river Luznice floodplain,' *Sbornik Vysoka Skola Zemedelska*, Vol. 5(2), p. 105-118.
- Standley PC & Steyermark JA 1958, *Flora of Guatemala, Vol. 24*, Chicago Natural History Museum, USA.
- Swift CE 1997, *Colorado State University Cooperative Extension*, Colorado State University, viewed: 15/02/2006, www.colostate.edu/Depts/CoopExt/TRA/PLANTS/stable.html.
- Uchytel, RJ 1989, Fire Effects Information System, U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory, viewed: 16/02/2006, www.fs.fed.us/database/feis/plants/tree/salnig/all.html.
- United States Department of Agriculture (USDA) 2006 USDA Plants Database, Washington, viewed: 16/02/2006, http://plants.nrcs.usda.gov/cgi_bin/topics.cgi?earl=characteristics.html.

Impact Assessment Record

Scientific Name: *Salix purpurea*

Common name: Willows

Voss EG 1972, *Michigan Flora: A guide to the identification and occurrence of the native and naturalized seed plants of the state*, Crabbrook Institute of Science, University of Michigan Herbarium, Michigan.

Walters SM et al (eds) 1989, *The European Garden Flora*, Cambridge University Press, UK.

Webb CJ, Sykes WR, Garnock-Jones PJ 1988, *Flora of New Zealand*, vol. 4, Manaaki Whenua Press, NZ

Zallar S nd, *Botanical Characteristics of the Willows*, Soil Conservation Authority, Kew.

Revisions

Date	Revised by	Revision

Invasiveness Assessment Record

Scientific name: *Salix viminalis*

Common Name: Willows

QUESTION	COMMENTS	RATING	CONFIDENCE
Establishment			
1. Germination requirements?	<i>S. viminalis</i> generally invade as seedlings (ARMCANZ, 2001), and as such are “virtually restricted to bare sediment that is wet for weeks or months following seed shed [and] seedlings need much light” which is predicted to occur “in most streams at intervals of about 5 to 20 years” (Cremer, 1999).	ML	MH
2. Establishment requirements?	Willows are described as heliophyllic (intolerant of shade) (Haines, 2004) and most species ...must not be overhung by larger plants or trees (Newsholme, 1992).	ML	MH
3. How much disturbance is required?	<i>S. viminalis</i> generally invade as seedlings (ARMCANZ, 2001), and as such are “virtually restricted to bare sediment that is wet for weeks or months following seed shed [and] seedlings need much light” (Cremer, 1999). This is a major disturbance with little or no competition from other plant species.	L	MH
Growth/Competitive			
4. Life form?	Semi-aquatic- All willows are described as growing on the banks of water courses or in moist locations (see references below), with some able to grow in riverbeds: <i>S. exigua</i> (Cody, 1996), <i>S. fragilis</i> (Maloney et al, 1999), <i>S. alba</i> , <i>S. x rubens</i> , and <i>S. viminalis</i> (Webb, Sykes & Garnock-Jones, 1988), and few species <i>S. cinerea</i> (Cremer, 1999) and <i>S. exigua</i> (Voss, 1972) can also establish on drier soil.	H	MH
5. Allelopathic properties?	Of the naturalised willows in Australia, allelopathic compounds have been demonstrated in <i>S. rubra</i> (Bokarev, Kefeli & Kapeljusnikova, 1966), <i>S. babylonica</i> (Koul et al, 1991), <i>S. fragilis</i> (Davison, 1965), <i>S. viminalis</i> (Bowen & Hoad, 1968), <i>S. alba</i> (Banzhaf et al, 1983) and <i>S. purpurea</i> (Gilliver, 1947).	MH	H
6. Tolerates herb pressure?	Some <i>Salix</i> species provide good fodder for both ruminants and horses...particularly in Australia (Newsholme, 1992). However, many species tolerate this grazing and/or are able to resprout from stump, eg. <i>S. cinerea</i> (Cremer, 1999), <i>S. x rubens</i> (Shafroth et al, 1994), <i>S. viminalis</i> (Newsholme, 1992), <i>S. exigua</i> (Uchytel, 1989).	MH	MH
7. Normal growth rate?	“ <i>Salix</i> are fast growing trees or shrubs, rarely prostrate” (Spencer, 1997). Where growth rates are described, tree and shrub forms of <i>Salix</i> are recorded as vigorous or fast growing, eg. <i>S. alba</i> (Spencer, 1997), <i>S. glaucophylloides</i> (Newsholme, 1992), <i>S. nigra</i> (Cremer, 1995), <i>S. purpurea</i> (Webb, Sykes & Garnock-Jones, 1988) and <i>S. x rubens</i> (Meikle).	H	MH
8. Stress tolerance to frost, drought, w/logg, sal. etc?	FIRE “If a tree is completely girdled by fire at ground level it may die without coppicing...however young trees tend to sprout from the buried portion of their stem” (Cremer, 1999), indicating some fire tolerance in tree and shrub willows in general. FROST All tree and shrub species (except <i>S. humboldtiana</i>) in this study are recorded as tolerating USDA hardiness zones of between 1 and 6 (average minimum temperatures between –46C and –17C) (Bailey & Bailey, 1976, Griffiths, 1992). <i>S. humboldtiana</i> is susceptible to frost (Newsholme, 1992). DROUGHT All willows are described as growing on the banks or in the riverbeds of water courses or in moist locations (Carr, 1996; Carr et. al, 1992; Cody, 1996; Davis, 1982; Howard, 1988; Ladson, et al, 1997; Maloney et al, 1999; Munz, 1963; Voss, 1972; Webb, Sykes & Garnock-Jones, 1988) suggesting a low drought tolerance; and only few species (<i>S. cinerea</i> and <i>S. exigua</i>) can also establish on drier soil (but	MH	MH

Invasiveness Assessment Record

Scientific name: *Salix viminalis*

Common Name: Willows

QUESTION	COMMENTS	RATING	CONFIDENCE
	are not necessarily drought tolerant), with <i>S. purpurea</i> alone tolerating extremely dry, sandy soils (Newsholme, 1992). WATERLOGGING Those species able to grow in riverbeds must have high tolerance of waterlogging (<i>S. exigua</i>, Cody, 1996; <i>S. fragilis</i>, Maloney et al, 1999; <i>S. alba</i>, <i>S.x rubens</i>, and <i>S. viminalis</i>; Webb, Sykes & Garnock-Jones, 1988) and also <i>S. cinerea</i> (Cremer, 1999). SALINITY <i>S. alba</i> is “the most tolerant of all willows to brackish water” (Zallar). <i>S. cinerea</i> “tolerates salt-laden air” (Newsholme, 1992), <i>S. fragilis</i>, <i>S. matsudana</i> & <i>S. sericeana</i> tolerate high levels of salinity (Crouch & Honeyman, 1986). <i>S. nigra</i> has moderately high tolerance of salt (Swift, 1997) and <i>S. purpurea</i> shows “considerable tolerance for salt water” (Newsholme, 1992). <i>S. viminalis</i> are highly tolerant of frost, have some tolerance of fire, and are highly tolerant of either waterlogging or salinity, but not of drought.		
Reproduction			
9. Reproductive system	<i>S. viminalis</i> is capable of regenerating both vegetatively and by seed (Ladson et al, 1997).	H	MH
10. Number of propagules produced?	“A large crown would produce over 500 000 seeds (Cremer, 1999). Seeds numerous, very small, each with a tuft of long hairs (Tutin, 1993).	H	MH
11. Propagule longevity?	“Willow seed is very short-lived” with longer-lived species recorded at surviving 8-10 weeks (Cremer, 1999).	L	MH
12. Reproductive period?	Following reproductive maturity “flowering tends to be ample and to occur every year” (Cremer, 1999). <i>S. cinerea</i> “stands are mostly monoculture excluding 97% of sunlight and most other species” (Cremer, 1999). The oldest stem <i>S. exigua</i> in this study was 31 years (Ottenbreit & Staniforth, 1992). An old <i>S. fragilis</i> tree was observed to 130 years (Meikle, 1984).	H	MH
13. Time to reproductive maturity?	“Flowering and the production of viable seed may begin two to three years after germination, provided the plant is at least 1m tall if it is a shrub willow, or 2m tall if it is a tree willow...In some taxa (eg. <i>S. alba</i>) flowering tends to begin at larger sizes” (Cremer, 1999), which is probably still within 5 years. For plants that have reproduced vegetatively, this may be reduced, as in <i>S. nigra</i>, observed flowering on cuttings produced from < 1 year old growth (Crouch & Honeyman, 1986).	ML	MH
Dispersal			
14. Number of mechanisms?	Vegetative propagules and seed spread by water. “Seed is easily carried by wind” (Cremer, 1999).	H	MH
15. How far do they disperse?	“Seed is easily carried by wind for more than 1km and some travels for up to 50km or even 100km (Cremer, 1999) for species that commonly reproduce by seed such as <i>S. viminalis</i> (ARMCANZ, 2001).	H	MH

Invasiveness Assessment Record

Scientific name: *Salix viminalis*

Common Name: Willows

References cited:

- Agriculture & Resource Management Council of Australia & New Zealand (ARMCANZ) 2001, *Weeds of National Significance Willow (Salix taxa, excluding S. babylonica, S. x calodendron and S. x reichardtii) Strategic Plan*, National Weeds Strategy Executive Committee, Launceston.
- Bahnzaf R, Kranzle M, Muhle H & Winkler S 1983, 'Effect of leaf leachates on nitrogen mineralization [German],' *Verhandlungen der Gesellschaft fur Okologie*, vol. 10, p. 63-70.
- Bailey LH & Bailey LZ 1976 *Hortus Third*, Macmillan, New York & London.
- Besaans (ed.) 1995, *Plant Protection News* vol. 47, pp. 20-24.
- Bokarev KS, Kefeli VI & Kapeljusnikova LM 1966, 'Chemical and physiological properties of natural inhibitors from *Salix rubra* [Russian],' *Fizio. Rast.*, Vol. 13(2), p. 274-282.
- Bowen MR & Hoad GV 1968, 'Inhibitor content of phloem and xylem sap obtained from willow (*Salix viminalis*) entering dormancy,' *Planta.*, vol 81(1), p. 64-70.
- Carcaillet C, Bergeron Y, Richard PJH, Frechette B, Gauthier S & Prairie YT 2001 'Change of fire frequency in the eastern Canadian boreal forests during the Holocene: does vegetation composition or climate trigger the fire regime?' *Journal of Ecology*, vol. 89, p. 930-946.
- Carr GW 1996, 'Salix,' in Walsh NG & Entwisle TJ (Eds.), *Flora of Victoria*, Vol. 3, Inkata Press, Melbourne.
- Carr, GW, Yogovic, JV & Robinson, KE 1992, *Environmental Weed Invasions in Victoria*, Department of Conservation and Environment, Vic.
- Cody WJ 1996, *Flora of the Yukon Territory*, NRC Research Press, Ottawa.
- Cremer KW 1995, *Willow Identification for river management in Australia*, CSIRO Division of Forestry, Orange, NSW.
- Cremer K 1999 *Willow Management for Australian Rivers* CSIRO Forestry and Forest Products, Kingston ACT.
- Cremer, K 2001 *Exterminate Wild Pussy Willows and its most invasive relative,s* CSIRO Forestry and Forest Products, Kingston ACT.
- Cremer K 2003 'Introduced willows can become invasive pests in Australia,' *Biodiversity*, Vol. 4(4), p. 17-24.
- Cremer K, Van Kraayenoord C, Parker N & Streatfield S 1995, 'Willows spreading by seed,' *Australian Journal of Soil and Water Conservation*, Vol 8 (4), p. 18-27.
- Crouch RJ & Honeyman MN 1986, 'The relative slat tolerance of willow cuttings,' *Journal of Soil Conservation*, vol 42(2), p. 103-104.
- Davis PH 1982, *Flora of Turkey and the east Aegean Islands*, Vol. 7, Edinburgh Uni Press, Edinburgh.
- Davison RM 1965, 'Some properties of a plant growth inhibitor present in xylem sap of woody species,' *Australian Journal of Biological Sciences*, vol. 18(3), p. 475-486.
- Fircks HA von, Daurin A (ed.), Junttila O (ed.), Nilsen J 1985 'Frost hardness of fast-growing *Salix* species,' *Plant production in the north. Proceeding from 'Plant adaptation workshop'*, Norway.
- Gilliver K 1947, 'The effect of plant extracts on the germination of the conidia of *Venturia inaequalis*,' *Ann. Appl. Biol.*, vol. 34(1), p. 136-143.
- Griffiths M 1992, *The New Royal Horticultural Society dictionary of gardening*, vol. 4, Macmillan, London.
- Haines A 2004 *Salix myrcoides (bayberry willow) Conservation and Research Plan for New England*, New England Flower Society, Framingham, Massachusetts, USA.
- Henderson L 1991 'Alien invasive *Salix* spp. (willows) in the grassland biome of South Africa,' *South African Forestry Journal*, vol. 157, p. 91-95.
- Hitchcock CL & Cronquist A 1964, *Vascular Plants of the Pacific Northwest (Part 2)*, University of Washington Press, Seattle & London.
- Howard RA 1988, *Flora of the Lesser Antilles*, Vol. 4, Arnold Arboretum, Harvard Uni, Jamaica Plain, Massachusetts.
- Holm L et al 1979, *A geographical atlas of world weeds*, Wiley, New York.
- Koul VK, Raina A, Dhanna YP, Tickoo ML & Singh 1991, 'Evaluation of allelopathic influence of certain farm grown tree species on rice (*Oryza sativa* L. c.v. PC 19),' *Indian Journal of Forestr*, vol. 14(1), p. 54-57.
- Ladson A, Gerrish G, Carr G, Thexton E 1997, *Willows Along Victorian Waterways*, Waterways Unit, Department of Natural Resources and Environment, Vic, Australia.

Invasiveness Assessment Record

Scientific name: *Salix viminalis*

Common Name: Willows

Maloney RF, Keedwell, RJ, Wells NJ, Reergen AL & Nilsson RG 1999, 'Effect of willow removal on habitat use by five birds of braided rivers, McKenzie Basin, New Zealand, *New Zealand Journal of Ecology*, Vol. 23, P. 53-60.

Meikle RD 1984, *Willows and Poplars of Great Britain and Ireland*, Botanical Society of the British Isles, London.

Munz PA & Keck DD 1963, *A California Flora*, University of California Press, Berkeley & LA.

Newsholme C 1992, *Willows: The genus Salix*, Tumber Press, Portland & Oregon.

Ottenbreit KA & Staniforth JR 1992, 'Life cycle and age structure of ramets in an expanding population of *Salix exigua* (sandbar willow),' *Canadian Journal of Botany*, vol. 70(6), p. 1141-1146.

Purtle C, Stelling F, Martin D, Grossman T, Frankenberg J, Campbell S & Dwyer C 2001a *Willow Identification Guide*, Department of Land and Water Conservation, NSW.

Purtle C, Stelling F, Martin D, Grossman T, Frankenberg J, Campbell S & Dwyer C 2001b *Willows along watercourses: an introduction*, Department of Land and Water Conservation, NSW.

Purtle C, Stelling F, Martin D, Grossman T, Frankenberg J, Campbell S & Dwyer C 2001c Department of Land and Water Conservation, NSW.

Shafroth PB, Scott ML & Friedman JM 1994, 'Establishment, sex structure & breeding system of an exotic riparian willow, *Salix x rubens*,' *American Midland Naturalist*, vol. 132, p. 159-172.

Spencer R 1997, *Horticultural Flora of South-Eastern Australia*, vol. 2, UNSW Press, Australia.

Strutek M, Bauer V, Klimes L & Pinosova J 1988, 'Ecology of economically important plants in the river Luznice floodplain,' *Sbornik Vysoka Skola Zemedelska*, Vol. 5(2), p. 105-118.

Standley PC & Steyermark JA 1958, *Flora of Guatemala*, Vol. 24, Chicago Natural History Museum, USA.

Swift CE 1997, *Colorado State University Cooperative Extension*, Colorado State University, viewed: 15/02/2006, www.colostate.edu/Depts/CoopExt/TRA/PLANTS/stable.html.

Tutin TG 1993, *Flora Europaea*, University Press, Cambridge.

Uchytel, RJ 1989, Fire Effects Information System, U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory, viewed: 10/01/2000, <http://www.fs.fed.us/database/feis/plants/tree/salex/all.html>.

Voss EG 1972, *Michigan Flora: A guide to the identification and occurrence of the native and naturalized seed plants of the state*, Crabrook Institute of Science, University of Michigan Herbarium, Michigan.

Walters SM et al (eds) 1989, *The European Garden Flora*, Cambridge University Press, UK.

Webb, Sykes & Garnock-Jones, 1988 CJ, Sykes WR, Garnock-Jones PJ 1988, *Flora of New Zealand*, vol. 4, Manaaki Whenua Press, NZ

Zallar S nd, *Botanical Characteristics of the Willows*, Soil Conservation Authority, Kew.

S. cinerea, S. fragilis, S. x rubens & S. nigra are identified by Ladson et al as outstandingly invasive because of their biology and ecology, specifically their reproductive ability.

Revisions

Date	Revised by	Revision

Present distribution of *Salix viminalis* in Victoria

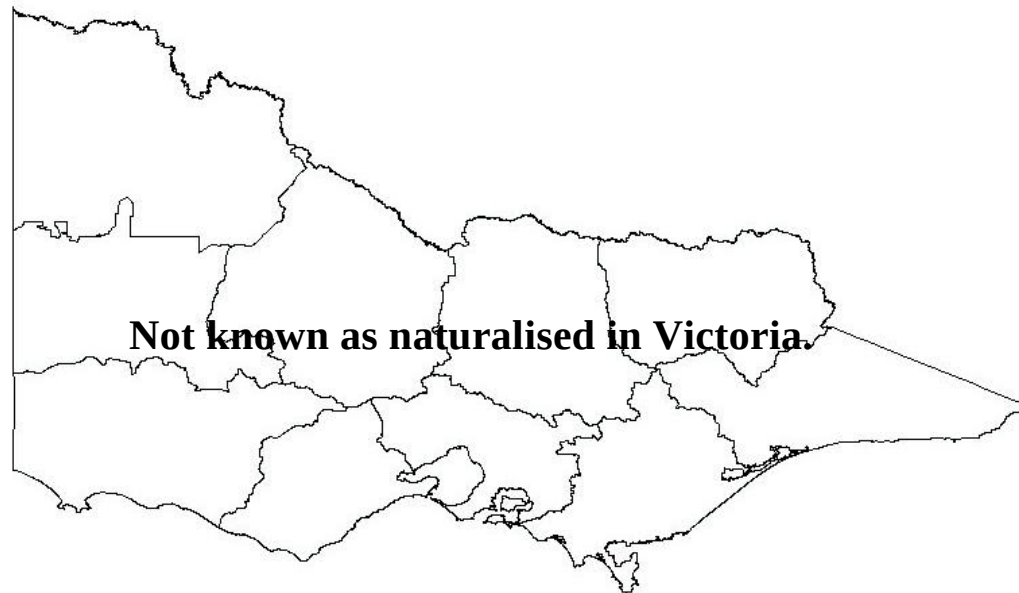
Scientific name: *Salix viminalis* L.

Common name(s): basket willow

Status:

Habitat:

Riverbeds (Webb *et al* 1988).



Potential distribution of *Salix viminalis* in Victoria

Scientific name: *Salix viminalis* L.

Common name(s): basket willow

Status:

Habitat:

Riverbeds (Webb *et al* 1988).

Potential distribution produced from CLIMATE modelling refined by applying suitable landuse and vegetation type overlays with CMA boundaries

MAP OVERLAYS USED.

Land Use:

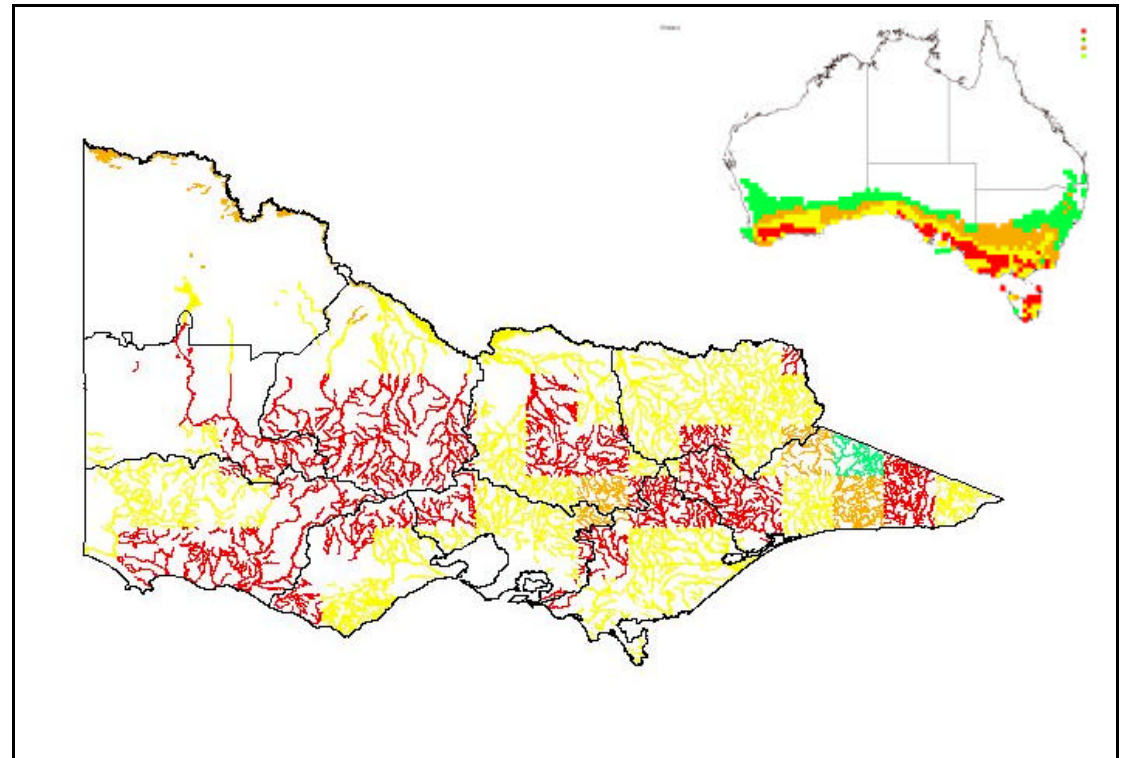
Broad vegetation types

Swamp scrub; riverine grassy woodland; riparian forest

Colours indicate possibility of *Salix viminalis* infesting these areas.

 Red	= Very high	 Yellow	= High
 Orange	= Medium	 Green	= Likely

In the non-coloured areas the plant is unlikely to establish as the climate, soil or landuse is not presently suitable.



Impact Assessment Record

Scientific Name: *Salix viminalis*

Common name: Willows

QUESTION	COMMENTS	RATING	CONFIDENCE
Social			
1. Restrict human access?	Willows can form dense thickets several metres thick, with densely spaced stems (FEIS, 2000) that could be major impediments to access waterways. <i>S. viminalis</i> is a thicket-forming species (Webb et al, 1988).	H	MH
2. Reduce tourism?	<i>S. viminalis</i> is a thicket-forming species (Webb et al, 1988) that may decrease access to water for fishing, canoeing and swimming.	MH	MH
3. Injurious to people?	No reference to human injury found in any reference. Toxicity rated as 'none' for the species summarised in the USDA Plants Database (2006) including <i>S. purpurea</i> , <i>S. exigua</i> , <i>S. nigra</i> , <i>S. x sepulcralis</i> , <i>S. alba</i> . Presume no toxicity for any <i>Salix</i> .	L	MH
4. Damage to cultural sites?	As semi-aquatic species, confined to stream banks or beds or moist locations (Carr, 1996; Carr et al, 1992; Cody, 1996; Davis, 1982; Howard, 1988; Ladson et al, 1997; Maloney et al, 1999; Munz, 1963; Voss, 1972; Webb, Sykes & Garnock-Jones, 1988) willows are unlikely to grow near enough to cause structural or visual damage to cultural sites. However, during floods, senescent trees can drop large branches or trunks into waterways and a build up of material behind these snags can destroy bridges (ARMCANZ, 2001). Major damage to buildings can occur when streams change route because they have become clogged with mats of willow roots. A Tasmanian Landcare group was formed in response to flooded homes, the cause of which was attributed to stream blockages by willow roots encroaching into streams (Sarah Holland-Clift pers. comm.).	H	MH
Abiotic			
5. Impact flow?	<i>S. viminalis</i> appear to be confined to riverbanks (Webb et al, 1988), making them unlikely to impact on flow.	L	MH
6. Impact water quality?	As deciduous plants (Carr, 1996), all shrub and tree willows have mass autumn leaf fall, which leads to decreased oxygen levels (Ladson et al, 1997). Intense shading by willows, which tend to have more dense canopies than native species decreases water temperature (Ladson et al, 1997).	H	MH
7. Increase soil erosion?	<i>S. viminalis</i> appear to be confined to riverbanks (Webb et al, 1988), making them unlikely to cause erosion; indeed willows were often planted to ameliorate erosion on revegetated banks (Ladson et al, 1997).	L	MH
8. Reduce biomass?	As woody plants that can form dense thickets, or large shrubs or trees (Carr, 1996), willows are capable of increasing biomass where they replace lower or less dense vegetation as they commonly do in disturbed sites (Cremer, 1999).	L	MH
9. Change fire regime?	Willows are low flammable/combustible trees (Carcaillet et al, 2001), likely to greatly change the frequency and intensity of fire risk.	H	H

Impact Assessment Record

Scientific Name: *Salix viminalis*

Common name: Willows

QUESTION	COMMENTS	RATING	CONFIDENCE
Community Habitat			
10. Impact on composition (a) high value EVC	Basin= East Gippsland- Cann River East Branch (ISC= Excellent); CMA= East Gippsland; CLIMATE=VH. Several suckering species have been recorded forming dense thickets that exclude sunlight and most other species, including <i>S. cinerea</i> , (Cremer, 1999) and <i>S. fragilis</i> (Henderson, 1991). <i>S. viminalis</i> is a thicket-forming species (Webb et al, 1988), likely to be capable of displacing all species within a layer.	H	MH
(b) medium value EVC	All Victorian waterbodies are assumed to be high value EVCs.	L	H
(c) low value EVC	All Victorian waterbodies are assumed to be high value EVCs.	L	H
11. Impact on structure?	Several suckering species have been recorded forming dense thickets that exclude sunlight and most other species, including <i>S. cinerea</i> , (Cremer, 1999) and <i>S. fragilis</i> (Henderson, 1991). <i>S. viminalis</i> is a thicket-forming species (Webb et al, 1988), likely to be capable of having the same major effect on all layers of native vegetation.	H	MH
12. Effect on threatened flora?			
Fauna			
13. Effect on threatened fauna?	All willows are capable of invading riparian zones and reducing the habitat available to vertebrates. For example, the rare Broad-toothed Rat that favours drainage-line vegetation (Ladson et al, 1997). Other species?		
14. Effect on non-threatened fauna?	Intense shading decreases primary production in waterways, impacting on invertebrates and fish (Ladson et al, 1997). Reduce indigenous vegetation which would otherwise provide habitat (especially tree hollows) and pollen and nectar food sources (Ladson, 1997) “Dense shade and mat-forming willow roots suppress and kill indigenous understorey [which is] important habitat for insects, birds and mammals. Bare banks beneath willows provide little protection for frogs, water rats, snakes, lizards and other fauna. Willows do not provide nectar for native birds...Willows also have few hollows, important habitat for over half of our woodland birds and mammals” (Purtle et al, 2001b). Reduction in habitat for fauna, leading to reduction in numbers of individuals but not to local extinction.	MH	MH
15. Benefits fauna?	<i>S. exigua</i> “stands provide excellent cover for numerous wildlife species” in America (FEIS, 2000). <i>S. viminalis</i> is a thicket-forming species (Webb et al, 1988) that might also provide habitat.	MH	MH

Impact Assessment Record

Scientific Name: *Salix viminalis*

Common name: Willows

QUESTION	COMMENTS	RATING	CONFIDENCE
16. Injurious to fauna?	No reference to animal injury found in any reference.	L	H
Pest Animal			
17. Food source to pests?	The palatability of other species is unknown.	M	L
18. Provides harbor?	<i>S. exigua</i> “stands provide excellent cover for numerous wildlife species” (FEIS, 2000). <i>S. viminalis</i> is also a thicket-forming species (Webb et al, 1988) that might harbour foxes and rabbits.	H	MH
Agriculture			
19. Impact yield?	Species present as agricultural weeds: <i>S. alba</i> in NZ and USA, <i>S. babylonica</i> and <i>S. cinerea</i> in NZ, <i>S. exigua</i> in USA, <i>S. nigra</i> in USA and <i>S. fragilis</i> is a principal agricultural weed in NZ (Holm et al, 1979). As willows are associated with waterways and not recorded as invaders of pasture or crops, their ability to form dense thickets that impede access to waterways for irrigation is likely to be the only impact they have on agriculture. Willow root mats reduce access to flowing water for irrigation purposes (Sarah Holland-Clift pers. comm.). <i>S. viminalis</i> is a thicket-forming (Webb et al, 1988), species which may reduce access to waterways for irrigation. They are likely to have a minor impact on the quantity of produce.	ML	MH
20. Impact quality?	Generally willows are valued for shade and browsing for livestock (Besaans, 1995).	L	MH
21. Affect land value?	“Fibrous willow roots and dense willow foliage trap large amounts of silt which can decrease channel capacity, exacerbate flooding and change flood patterns...Willows encroaching into the centre of streams interrupt the flow of water which results in stream flows being directed into watercourse banks, causing erosion.” (Purtle, 2001b). Whilst risk of floods and erosion may cause decrease in land value in some incidences, with a state wide view, this is likely to be negligible.	L	MH
22. Change land use?	Willows are associated with waterways and not recorded as invaders of pasture or crops in the extensive literature. Whilst control may be required (see Q. 23) there is little risk that land use would need to change as a consequence of their invasion of agricultural land.	L	H
23. Increase harvest costs?	Some willow control to maintain waterways for irrigation may increase harvest costs by a minor amount. This is likely to be for the thicket-forming species such as <i>S. viminalis</i> (Webb et al, 1988). In the Jerilderie area 80% of farmers are donating a rebate to fund a project manager for willows in Yanco Creek, because their root mats reduce access to creek water for irrigation (Sarah Holland-Clift).	MH	MH
24. Disease host/vector?	Not found in the extensive literature.	L	H

Impact Assessment Record

Scientific Name: *Salix viminalis*

Common name: Willows

References cited:

Agriculture & Resource Management Council of Australia & New Zealand (ARMCANZ) 2001, *Weeds of National Significance Willow (Salix taxa, excluding S. babylonica, S. x calodendron and S. x reichardtii) Strategic Plan*, National Weeds Strategy Executive Committee, Launceston.

Aiken SG, Dallwitz MJ, Consaul LL, McJannet CL, Gillespie LJ, Boles RL, Argus GW, Gillett JM, Scott PJ, Elven R, LeBlanc MC, Brysting AK & Solstad H 1999, *Flora of the Canadian Arctic Archipelago: Descriptions, Illustration, Identification, and Information Retrieval*, Memorial University of Newfoundland, viewed: 16/02/2006, www.mun.ca/biology/delta/arctic/_ca/www/wl.htm.

Bailey LH & Bailey LZ 1976 *Hortus Third*, Macmillan, New York & London.

Besaans (ed.) 1995, *Plant Protection News* vol. 47, pp. 20-24.

Carcaillet C, Bergeron Y, Richard PJH, Frechette B, Gauthier S & Prairie YT 2001 'Change of fire frequency in the eastern Canadian boreal forests during the Holocene: does vegetation composition or climate trigger the fire regime?' *Journal of Ecology*, vol. 89, p. 930-946.

Carr GW 1996, 'Salix,' in Walsh NG & Entwistle TJ (Eds.), *Flora of Victoria*, Vol. 3, Inkata Press, Melbourne.

Carr, GW, Yoganovic, JV & Robinson, KE 1992, *Environmental Weed Invasions in Victoria*, Department of Conservation and Environment, Vic.

Cody WJ 1996, *Flora of the Yukon Territory*, NRC Research Press, Ottawa.

Cremer KW 1995, *Willow Identification for river management in Australia*, CSIRO Division of Forestry, Orange, NSW.

Cremer K 1999 *Willow Management for Australian Rivers* CSIRO Forestry and Forest Products, Kingston ACT.

Cremer, K 2001 *Exterminate Wild Pussy Willows and its most invasive relative,s* CSIRO Forestry and Forest Products, Kingston ACT.

Crouch RJ & Honeyman MN 1986, 'The relative salt tolerance of willow cuttings,' *Journal of Soil Conservation*, vol 42(2), p. 103-104.

Davis PH 1982, *Flora of Turkey and the east Aegean Islands, Vol. 7*, Edinburgh Uni Press, Edinburgh.

Fircks HA von, Daurin A (ed.), Junttila O (ed.), Nilsen J 1985 'Frost hardiness of fast-growing *Salix* species,' *Plant production in the north. Proceeding from 'Plant adaptation workshop*, ' Norway.

Haines A 2004 *Salix myrcoides (bayberry willow) Conservation and Research Plan for New England*, New England Flower Society, Framingham, Massachusetts, USA.

Henderson L 1991 'Alien invasive *Salix* spp. (willows) in the grassland biome of South Africa,' *South African Forestry Journal*, vol. 157, p. 91-95.

Hitchcock CL & Cronquist A 1964, *Vascular Plants of the Pacific Northwest (Part 2)*, University of Washington Press, Seattle & London.

Howard RA 1988, *Flora of the Lesser Antilles*, Vol. 4, Arnold Arboretum, Harvard Uni, Jamaica Plain, Massachusetts.

Holm L et al 1979, *A geographical atlas of world weeds*, Wiley, New York.

Kennedy SA, Ganf FF & Walker KF 2003, 'Does salinity influence the distribution of exotic willows (*Salix* spp.) along the Lower River Murray?' *Marine and Freshwater Research*, vol 54, p. 825-831.

Ladson A, Gerrish G, Carr G, Thexton E 1997, *Willows Along Victorian Waterways*, Waterways Unit, Department of Natural Resources and Environment, Vic, Australia.

Maloney RF, Keedwell, RJ, Wells NJ, Reergen AL & Nilsson RG 1999, 'Effect of willow removal on habitat use by five birds of braided rivers, McKenzie Basin, New Zealand, *New Zealand Journal of Ecology*, Vol. 23, P. 53-60.

Meikle RD 1984, *Willows and Poplars of Great Britain and Ireland*, Botanical Society of the British Isles, London.

Munz PA & Keck DD 1963, *A California Flora*, University of California Press, Berkeley & LA.

Muyt A 2001, *Bush invaders of South-East Australia*, RG and FJ Richardson, Meredith, Vic.

Impact Assessment Record

Scientific Name: *Salix viminalis*

Common name: Willows

Newsholme C 1992, *Willows: The genus Salix*, Tumber Press, Portland & Oregon.

Purtle C, Stelling F, Martin D, Grossman T, Frankenberg J, Campbell S & Dwyer C 2001a *Willow Identification Guide*, Department of Land and Water Conservation,

Purtle C, Stelling F, Martin D, Grossman T, Frankenberg J, Campbell S & Dwyer C 2001b *Willows along watercourses: an introduction*, Department of Land and Water Conservation,

Purtle C, Stelling F, Martin D, Grossman T, Frankenberg J, Campbell S & Dwyer C 2001c Department of Land and Water Conservation,

Shafroth PB, Scott ML & Friedman JM 1994, 'Establishment, sex structure & breeding system of an exotic riparian willow, *Salix x rubens*,' *American Midland Naturalist*, vol. 132, p. 159-172.

Strutek M, Bauer V, Klimes L & Pinosova J 1988, 'Ecology of economically important plants in the river Luznice floodplain,' *Sbornik Vysoka Skola Zemedelska*, Vol. 5(2), p. 105-118.

Standley PC & Steyermark JA 1958, *Flora of Guatemala*, Vol. 24, *Chicago Natural History Museum, USA*.

Swift CE 1997, *Colorado State University Cooperative Extension*, Colorado State University, viewed: 15/02/2006, www.colostate.edu/Depts/CoopExt/TRA/PLANTS/stable.html.

Uchytel, RJ 1989, Fire Effects Information System, U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory, viewed: 16/02/2006, www.fs.fed.us/database/feis/plants/tree/salnig/all.html.

United States Department of Agriculture (USDA) 2006 USDA Plants Database, Washington, viewed: 16/02/2006, http://plants.nrcs.usda.gov/cgi_bin/topics.cgi?earl=characteristics.html.

Voss EG 1972, *Michigan Flora: A guide to the identification and occurrence of the native and naturalized seed plants of the state*, Crabbrook Institute of Science, University of Michigan Herbarium, Michigan.

Walters SM et al (eds) 1989, *The European Garden Flora*, Cambridge University Press, UK.

Webb CJ, Sykes WR, Garnock-Jones PJ 1988, *Flora of New Zealand*, vol. 4, Manaaki Whenua Press, NZ

Zallar S nd, *Botanical Characteristics of the Willows*, Soil Conservation Authority, Kew.

Revisions

Date	Revised by	Revision

Invasiveness Assessment Record

Scientific name: *Salix x pendulina*

Common Name: Willows

QUESTION	COMMENTS	RATING	CONFIDENCE
Establishment			
1. Germination requirements?	“The ‘fragility’...of willows varies greatly and this is the single most important attribute conferring invasibility...by vegetative means.” The most fragile taxa include: <i>Salix fragilis</i> , <i>S. x rubens</i> , <i>S. x pendulina</i> , <i>S. alba</i> , <i>S. x sepulcralis</i> , and <i>S. matsudana</i> ‘ <i>Torulosa</i> ’. They take root where they lodge in water or on wet ground (Ladson et al, 1997)ie. Opportunistic species.	H	MH
2. Establishment requirements?	Willows are described as heliophyllic (intolerant of shade) (Haines, 2004) and most species ...must not be overhung by larger plants or trees (Newsholme, 1992).	ML	MH
3. How much disturbance is required?	<i>S. x pendulina</i> establish predominantly vegetatively (Ladson et al, 1997) tend to “invade riverbanks, lakesides, drainage channels, swaps, almost all wet places (Webb, Sykes & Garnock-Jones, 1988) that are, by their nature, disturbed ecosystems.	MH	MH
Growth/Competitive			
4. Life form?	Semi-aquatic- All willows are described as growing on the banks of water courses or in moist locations. <i>S. x pendulina</i> grows along streams	H	MH
5. Allelopathic properties?	Of the naturalised willows in Australia, allelopathic compounds have been demonstrated in <i>S. rubra</i> (Bokarev, Kefeli & Kapeljusnikova, 1966), <i>S. babylonica</i> (Koul et al, 1991), <i>S. fragilis</i> (Davison, 1965), <i>S. viminalis</i> (Bowen & Hoad, 1968), <i>S. alba</i> (Banzhaf et al, 1983) and <i>S. purpurea</i> (Gilliver, 1947). For other willow species , their “dense shade and mat-forming willow roots suppress and kill indigenous understorey” (Purtle et al, 2001b), suggesting that there might be an allelopathic basis for this lack of understorey beneath willow infestations, however no specific reference to <i>S. x pendulina</i> was found.	M	L
6. Tolerates herb pressure?	No information	M	L
7. Normal growth rate?	“ <i>Salix</i> are fast growing trees or shrubs, rarely prostrate” (Spencer, 1997). Where growth rates are described, tree and shrub forms of <i>Salix</i> are recorded as vigorous or fast growing, eg. <i>S. alba</i> (Spencer, 1997), <i>S. glaucophylloides</i> (Newsholme, 1992), <i>S. nigra</i> (Cremer, 1995), <i>S. purpurea</i> (Webb, Sykes & Garnock-Jones, 1988) and <i>S. x rubens</i> (Meikle).	H	MH

Invasiveness Assessment Record

Scientific name: *Salix x pendulina*

Common Name: Willows

QUESTION	COMMENTS	RATING	CONFIDENCE
8. Stress tolerance to frost, drought, w/logg, sal. etc?	FIRE “If a tree is completely girdled by fire at ground level it may die without coppicing...however young trees tend to sprout from the buried portion of their stem” (Cremer, 1999), indicating some fire tolerance in tree and shrub willows in general. FROST All tree and shrub species (except <i>S. humboldtiana</i>) in this study are recorded as tolerating USDA hardiness zones of between 1 and 6 (average minimum temperatures between –46C and –17C) (Bailey & Bailey, 1976, Griffiths, 1992). <i>S. humboldtiana</i> is susceptible to frost (Newsholme, 1992). DROUGHT All willows are described as growing on the banks or in the riverbeds of water courses or in moist locations (Carr, 1996; Carr et. al, 1992; Cody, 1996; Davis, 1982; Howard, 1988; Ladson, et al, 1997; Maloney et al, 1999; Munz, 1963; Voss, 1972; Webb, Sykes & Garnock-Jones, 1988) suggesting a low drought tolerance; and only few species (<i>S. cinerea</i> and <i>S. exigua</i>) can also establish on drier soil (but are not necessarily drought tolerant), with <i>S. purpurea</i> alone tolerating extremely dry, sandy soils (Newsholme, 1992). All willow species in this study are frost hardy (except <i>S. humboldtiana</i>) and all have some tolerance to fire, but are susceptible to drought (except <i>S. purpurea</i>). Except for the waterlogging and/or salt tolerant species, the remainder are probably not tolerant of waterlogging or salinity. <i>S. x pendulina</i> is likely to be tolerant to at least 2 and susceptible to at least 2.	ML	MH
Reproduction			
9. Reproductive system	<i>S. x pendulina</i> Twigs moderately fragile (Carr, 1996). Vegetative reproduction (ARMCANZ, 2001). Male and female trees present (Ladson et al, 1997) so probably capable of reproducing both vegetatively and by seed.	H	MH
10. Number of propagules produced?	“A large crown would produce over 500 000 seeds (Cremer, 1999). Seeds numerous, very small, each with a tuft of long hairs (Tutin, 1993).	H	MH
11. Propagule longevity?	“Willow seed is very short-lived” with longer-lived species recorded at surviving 8-10 weeks (Cremer, 1999).	L	MH
12. Reproductive period?	Following reproductive maturity “flowering tends to be ample and to occur every year” (Cremer, 1999). <i>S. cinerea</i> “stands are mostly monoculture excluding 97% of sunlight and most other species” (Cremer, 1999). The oldest stem <i>S. exigua</i> in this study was 31 years (Ottenbreit & Staniforth, 1992). An old <i>S. fragilis</i> tree was observed to 130 years (Meikle, 1984).	H	MH
13. Time to reproductive maturity?	“Flowering and the production of viable seed may begin two to three years after germination, provided the plant is at least 1m tall if it is a shrub willow, or 2m tall if it is a tree willow...In some taxa (eg. <i>S. alba</i>) flowering tends to begin at larger sizes” (Cremer, 1999), which is probably still within 5 years. For plants that have reproduced vegetatively, this may be reduced, as in <i>S. nigra</i>, observed flowering on cuttings produced from < 1 year old growth (Crouch & Honeyman, 1986).	ML	MH

Invasiveness Assessment Record

Scientific name: *Salix x pendulina*

Common Name: Willows

QUESTION	COMMENTS	RATING	CONFIDENCE
Dispersal			
14. Number of mechanisms?	Vegetative propagules and seed spread by water. "Seed is easily carried by wind" (Cremer, 1999).	H	MH
15. How far do they disperse?	In species where vegetative reproduction predominates, such as <i>S. x pendulina</i> (Ladson et al, 1997), <i>S. x rubens</i> provides evidence that "very few individuals observed long distances from existing mature trees and these were downstream of cities, towns and homesteads" (Shafroth et al, 1994).	MH	MH

References cited:

- Agriculture & Resource Management Council of Australia & New Zealand (ARMCANZ) 2001, *Weeds of National Significance Willow (Salix taxa, excluding S. babylonica, S. x calodendron and S. x reichardtii) Strategic Plan*, National Weeds Strategy Executive Committee, Launceston.
- Bahnzaf R, Kranzle M, Muhle H & Winkler S 1983, 'Effect of leaf leachates on nitrogen mineralization [German],' *Verhandlungen der Gesellschaft fur Okologie*, vol. 10, p. 63-70.
- Bailey LH & Bailey LZ 1976 *Hortus Third*, Macmillan, New York & London.
- Besaans (ed.) 1995, *Plant Protection News* vol. 47, pp. 20-24.
- Bokarev KS, Kefeli VI & Kapeljusnikova LM 1966, 'Chemical and physiological properties of natural inhibitors from *Salix rubra* [Russian],' *Fizio. Rast.*, Vol. 13(2), p. 274-282.
- Bowen MR & Hoad GV 1968, 'Inhibitor content of phloem and xylem sap obtained from willow (*Salix viminalis*) entering dormancy,' *Planta.*, vol 81(1), p. 64-70.
- Carcaillet C, Bergeron Y, Richard PJH, Frechette B, Gauthier S & Prairie YT 2001 'Change of fire frequency in the eastern Canadian boreal forests during the Holocene: does vegetation composition or climate trigger the fire regime?' *Journal of Ecology*, vol. 89, p. 930-946.
- Carr GW 1996, 'Salix,' in Walsh NG & Entwisle TJ (Eds.), *Flora of Victoria*, Vol. 3, Inkata Press, Melbourne.
- Carr, GW, Yogovic, JV & Robinson, KE 1992, *Environmental Weed Invasions in Victoria*, Department of Conservation and Environment, Vic.
- Cody WJ 1996, *Flora of the Yukon Territory*, NRC Research Press, Ottawa.
- Cremer KW 1995, *Willow Identification for river management in Australia*, CSIRO Division of Forestry, Orange, NSW.
- Cremer K 1999 *Willow Management for Australian Rivers* CSIRO Forestry and Forest Products, Kingston ACT.
- Cremer, K 2001 *Exterminate Wild Pussy Willows and its most invasive relative,s* CSIRO Forestry and Forest Products, Kingston ACT.
- Cremer K 2003 'Introduced willows can become invasive pests in Australia,' *Biodiversity*, Vol. 4(4), p. 17-24.
- Cremer K, Van Kraayenoord C, Parker N & Streatfield S 1995, 'Willows spreading by seed,' *Australian Journal of Soil and Water Conservation*, Vol 8 (4), p. 18-27.
- Crouch RJ & Honeyman MN 1986, 'The relative slat tolerance of willow cuttings,' *Journal of Soil Conservation*, vol 42(2), p. 103-104.
- Davis PH 1982, *Flora of Turkey and the east Aegean Islands*, Vol. 7, Edinburgh Uni Press, Edinburgh.
- Davison RM 1965, 'Some properties of a plant growth inhibitor present in xylem sap of woody species,' *Australian Journal of Biological Sciences*, vol. 18(3), p. 475-486.
- Fircks HA von, Daurin A (ed.), Junttila O (ed.), Nilsen J 1985 'Frost hardiness of fast-growing *Salix* species,' *Plant production in the north. Proceeding from 'Plant adaptation workshop,'* Norway.
- Gilliver K 1947, 'The effect of plant extracts on the germination of the conidia of *Venturia inaequalis*,' *Ann. Appl. Biol.*, vol. 34(1), p. 136-143.

Invasiveness Assessment Record

Scientific name: *Salix x pendulina*

Common Name: Willows

Griffiths M 1992, *The New Royal Horticultural Society dictionary of gardening*, vol. 4, Macmillan, London.

Haines A 2004 *Salix myricoides (bayberry willow) Conservation and Research Plan for New England*, New England Flower Society, Framingham, Massachusetts, USA.

Henderson L 1991 'Alien invasive *Salix* spp. (willows) in the grassland biome of South Africa,' *South African Forestry Journal*, vol. 157, p. 91-95.

Hitchcock CL & Cronquist A 1964, *Vascular Plants of the Pacific Northwest (Part 2)*, University of Washington Press, Seattle & London.

Howard RA 1988, *Flora of the Lesser Antilles*, Vol. 4, Arnold Arboretum, Harvard Uni, Jamaica Plain, Massachusetts.

Holm L et al 1979, *A geographical atlas of world weeds*, Wiley, New York.

Koul VK, Raina A, Dhanna YP, Tickoo ML & Singh 1991, 'Evaluation of allelopathic influence of certain farm grown tree species on rice (*Oryza sativa* L. c.v. PC 19),' *Indian Journal of Forestr*, vol. 14(1), p. 54-57.

Ladson A, Gerrish G, Carr G, Thexton E 1997, *Willows Along Victorian Waterways*, Waterways Unit, Department of Natural Resources and Environment, Vic, Australia.

Maloney RF, Keedwell, RJ, Wells NJ, Reergen AL & Nilsson RG 1999, 'Effect of willow removal on habitat use by five birds of braided rivers, MrKenzie Basin, New Zealand, *New Zealand Journal of Ecology*, Vol. 23, P. 53-60.

Meikle RD 1984, *Willows and Poplars of Great Britain and Ireland*, Botanical Society of the British Isles, London.

Munz PA & Keck DD 1963, *A California Flora*, University of California Press, Berkeley & LA.

Newsholme C 1992, *Willows: The genus Salix*, Tumber Press, Portland & Oregon.

Ottensbreit KA & Staniforth JR 1992, 'Life cycle and age structure of ramets in an expanding population of *Salix exigua* (sandbar willow),' *Canadian Journal of Botany*, vol. 70(6), p. 1141-1146.

Purtle C, Stelling F, Martin D, Grossman T, Frankenberg J, Campbell S & Dwyer C 2001a *Willow Identification Guide*, Department of Land and Water Conservation, NSW.

Purtle C, Stelling F, Martin D, Grossman T, Frankenberg J, Campbell S & Dwyer C 2001b *Willows along watercourses: an introduction*, Department of Land and Water Conservation, NSW.

Purtle C, Stelling F, Martin D, Grossman T, Frankenberg J, Campbell S & Dwyer C 2001c Department of Land and Water Conservation, NSW.

Shafroth PB, Scott ML & Friedman JM 1994, 'Establishment, sex structure & breeding system of an exotic riparian willow, *Salix x rubens*,' *American Midland Naturalist*, vol. 132, p. 159-172.

Spencer R 1997, *Horticultural Flora of South-Eastern Australia*, vol. 2, UNSW Press, Australia.

Strutek M, Bauer V, Klimes L & Pinosova J 1988, 'Ecology of economically important plants in the river Luznice floodplain,' *Sbornik Vysoka Skola Zemedelska*, Vol. 5(2), p. 105-118.

Standley PC & Steyermark JA 1958, *Flora of Guatemala*, Vol. 24, Chicago Natural History Museum, USA.

Swift CE 1997, *Colorado State University Cooperative Extension*, Colorado State University, viewed: 15/02/2006, www.colostate.edu/Depts/CoopExt/TRA/PLANTS/stable.html.

Tutin TG 1993, *Flora Europaea*, University Press, Cambridge.

Uchytel, RJ 1989, Fire Effects Information System, U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory, viewed: 10/01/2000, <http://www.fs.fed.us/database/feis/plants/tree/salexi/all.html>.

Voss EG 1972, *Michigan Flora: A guide to the identification and occurrence of the native and naturalized seed plants of the state*, Crabbrook Institute of Science, University of Michigan Herbarium, Michigan.

Walters SM et al (eds) 1989, *The European Garden Flora*, Cambridge University Press, UK.

Invasiveness Assessment Record

Scientific name: *Salix x pendulina*

Common Name: Willows

Webb, Sykes & Garnock-Jones, 1988 CJ, Sykes WR, Garnock-Jones PJ 1988, *Flora of New Zealand*, vo.l. 4, Manaaki Whenua Press, NZ

Zallar S nd, *Botanical Characteristics of the Willows*, Soil Conservation Authority, Kew.

S. cinerea, S. fragilis, S. x rubens & S. nigra are identified by Ladson et al as outstandingly invasive because of their biology and ecology, specifically their reproductive ability.

Revisions

Date

Revised by

Revision

Present distribution of *Salix x pendulina* in Victoria

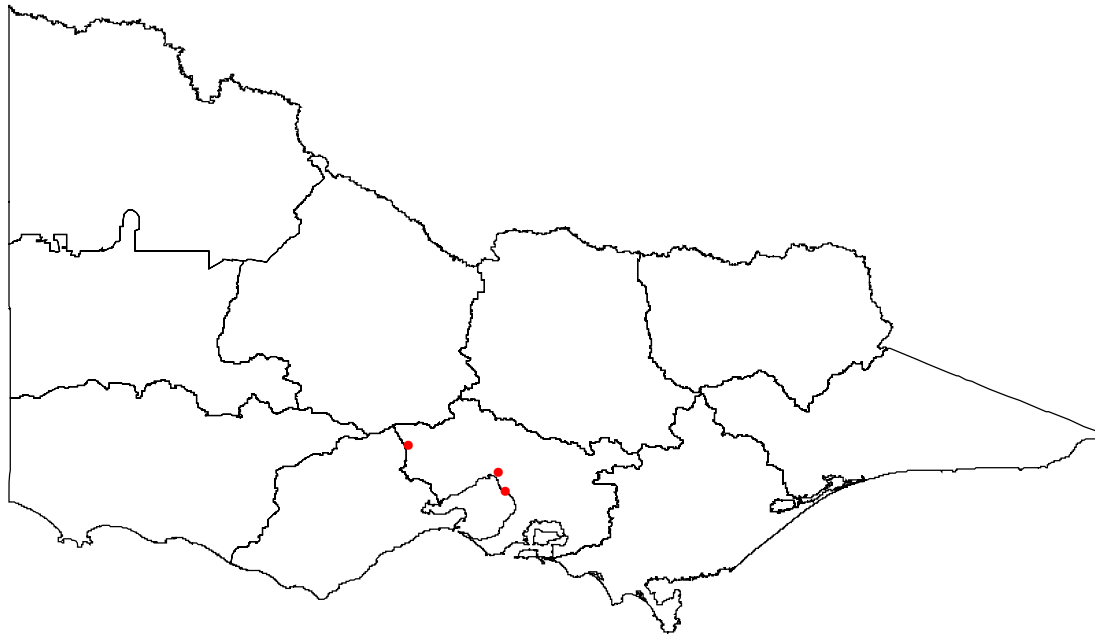
Scientific name: *Salix x pendulina* Wender.

Common name(s): Wisconsin weeping willow, niobe willow, weeping crack willow

Status:

Habitat:

Tends to 'invade riverbanks, lakesides, drainage channels, swaps, almost all wet places' (Webb *et al* 1988).



Potential distribution of *Salix x pendulina* in Victoria

Scientific name: *Salix x pendulina* Wender.

Common name(s): Wisconsin weeping willow, niobe willow, weeping crack willow

Status:

Habitat:

Tends to 'invade riverbanks, lakesides, drainage channels, swaps, almost all wet places' (Webb *et al* 1988).

Potential distribution produced from CLIMATE modelling refined by applying suitable landuse and vegetation type overlays with CMA boundaries

MAP OVERLAYS USED.

Land Use:

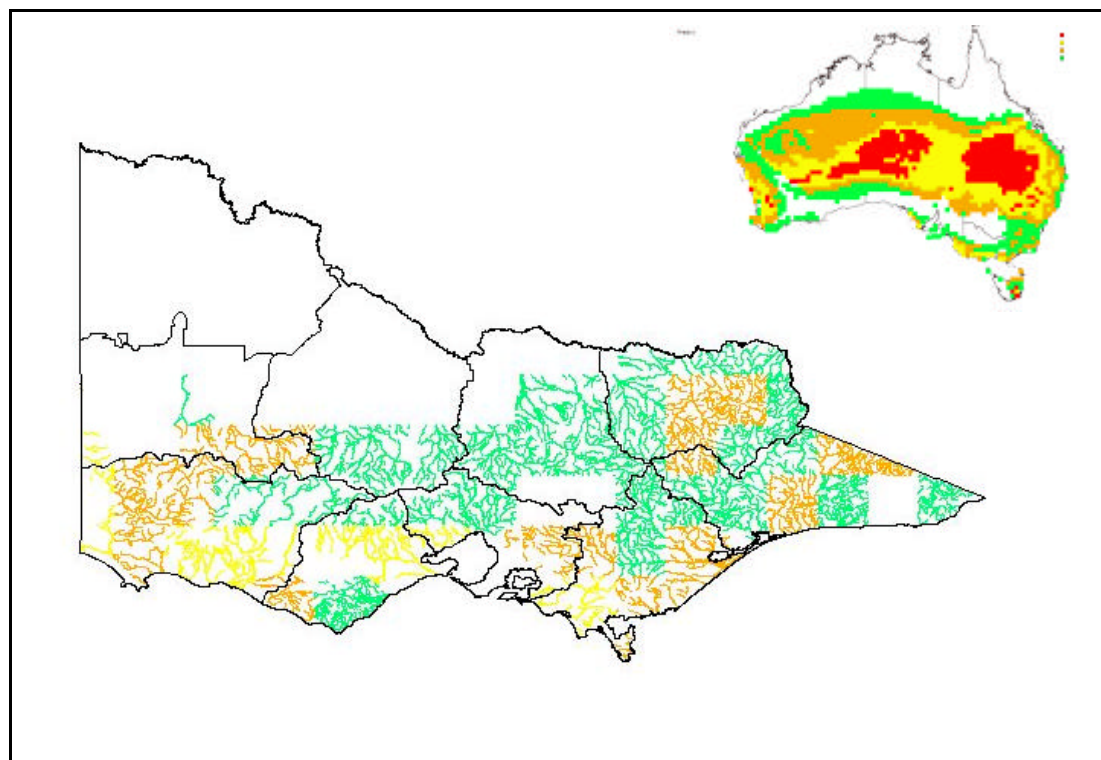
Broad vegetation types

Swamp scrub; riverine grassy woodland; riparian forest

Colours indicate possibility of *Salix x pendulina* infesting these areas.

 Red	= Very high	 Yellow	= High
 Orange	= Medium	 Green	= Likely

In the non-coloured areas the plant is unlikely to establish as the climate, soil or landuse is not presently suitable.



Impact Assessment Record

Scientific Name: *Salix x pendulina*

Common name: Willows

QUESTION	COMMENTS	RATING	CONFIDENCE
Social			
1. Restrict human access?	<i>S. x pendulina</i> tend to have single trunks (Carr, 1996), making them less likely to inhibit access by humans as they don't tend to form thickets.	L	MH
2. Reduce tourism?	<i>S. x chrysocoma</i> (syn. <i>S. x sepulcralis</i>) is an <i>S. babylonica</i> (weeping willow) hybrid (with <i>S. alba</i> var. <i>vitellina</i>) and so is <i>S. x pendulina</i> (<i>S. babylonica</i> x <i>S. fragilis</i>) (Meikle, 1984). Both resemble the weeping willow (Cremer, 1995), which is valued aesthetically and historically in waterways (ARMCANZ, 2001).	L	MH
3. Injurious to people?	No reference to human injury found in any reference. Toxicity rated as 'none' for the species summarised in the USDA Plants Database (2006) including <i>S. purpurea</i> , <i>S. exigua</i> , <i>S. nigra</i> , <i>S. x sepulcralis</i> , <i>S. alba</i> . Presume no toxicity for any <i>Salix</i> .	L	MH
4. Damage to cultural sites?	As semi-aquatic species, confined to stream banks or beds or moist locations (Carr, 1996; Carr et al, 1992; Cody, 1996; Davis, 1982; Howard, 1988; Ladson et al, 1997; Maloney et al, 1999; Munz, 1963; Voss, 1972; Webb, Sykes & Garnock-Jones, 1988) willows are unlikely to grow near enough to cause structural or visual damage to cultural sites. However, during floods, senescent trees can drop large branches or trunks into waterways and a build up of material behind these snags can destroy bridges (ARMCANZ, 2001). Major damage to buildings can occur when streams change route because they have become clogged with mats of willow roots. A Tasmanian Landcare group was formed in response to flooded homes, the cause of which was attributed to stream blockages by willow roots encroaching into streams (Sarah Holland-Clift pers. comm.).	H	MH
Abiotic			
5. Impact flow?	<i>S. x pendulina</i> tend to be confined to riverbanks (Carr, 1996), which makes them unlikely to impact on flow.	L	MH
6. Impact water quality?	As deciduous plants (Carr, 1996), all shrub and tree willows have mass autumn leaf fall, which leads to decreased oxygen levels (Ladson et al, 1997). Intense shading by willows, which tend to have more dense canopies than native species decreases water temperature (Ladson et al, 1997).	H	MH
7. Increase soil erosion?	<i>S. x pendulina</i> tend to be confined to riverbanks (Carr, 1996), which makes them unlikely to cause erosion, indeed willows were often planted to ameliorate erosion on revegetated banks (Ladson et al, 1997).	L	MH
8. Reduce biomass?	As woody plants that can form dense thickets, or large shrubs or trees (Carr, 1996), willows are capable of increasing biomass where they replace lower or less dense vegetation as they commonly do in disturbed sites (Cremer, 1999).	L	MH

Impact Assessment Record

Scientific Name: *Salix x pendulina*

Common name: Willows

QUESTION	COMMENTS	RATING	CONFIDENCE
9. Change fire regime?	Willows are low flammable/combustible trees (Carcaillet et al, 2001), likely to greatly change the frequency and intensity of fire risk.	H	H
Community Habitat			
10. Impact on composition (a) high value EVC	Basin=Werribee River- Spring Creek (ISC=Good); CMA=Port Phillip; CLIMATE= H. For willow species in general, their “dense shade and mat-forming willow roots suppress and kill indigenous understorey” (Purtle et al, 2001b). Potential displacement of some dominant species within a layer.	MH	MH
(b) medium value EVC	Aquatic species. All Victorian water bodies considered to comprise high value EVCs only (Weiss pers. coms.) ⁱ .	L	H
(c) low value EVC	Aquatic species. All Victorian water bodies considered to comprise high value EVCs only (Weiss pers. coms.) ⁱⁱ .	L	H
11. Impact on structure?	For willow species in general, their “dense shade and mat-forming willow roots suppress and kill indigenous understorey” (Purtle et al, 2001b).	MH	MH
12. Effect on threatened flora?	No information found.	MH	L
Fauna			
13. Effect on threatened fauna?	No information found.	MH	L
14. Effect on non-threatened fauna?	Intense shading decreases primary production in waterways, impacting on invertebrates and fish (Ladson et al, 1997). Reduce indigenous vegetation which would otherwise provide habitat (especially tree hollows) and pollen and nectar food sources (Ladson, 1997) “Dense shade and mat-forming willow roots suppress and kill indigenous understorey [which is] important habitat for insects, birds and mammals. Bare banks beneath willows provide little protection for frogs, water rats, snakes, lizards and other fauna. Willows do not provide nectar for native birds...Willows also have few hollows, important habitat for over half of our woodland birds and mammals” (Purtle et al, 2001b). Reduction in habitat for fauna, leading to reduction in numbers of individuals but not to local extinction.	MH	MH
15. Benefits fauna?	<i>S. x pendulina</i> tend to have single trunks (Carr, 1996), which would make them less likely to provide habitat for fauna than thicket-forming species. The palatability of this species is unknown.	M	L
16. Injurious to fauna?	No reference to animal injury found in any reference.	L	H

Impact Assessment Record

Scientific Name: *Salix x pendulina*

Common name: Willows

QUESTION	COMMENTS	RATING	CONFIDENCE
Pest Animal			
17. Food source to pests?	The palatability of this species is unknown.	M	L
18. Provides harbor?	<i>S. x pendulina</i> tend to have single trunks (Carr, 1996), which would make them less likely to provide harbour for pest animals than thicket-forming species.	L	MH
Agriculture			
19. Impact yield?	Generally willows are valued for shade and browsing for livestock (Besaans, 1995).	L	MH
20. Impact quality?	Generally willows are valued for shade and browsing for livestock (Besaans, 1995).	L	MH
21. Affect land value?	“Fibrous willow roots and dense willow foliage trap large amounts of silt which can decrease channel capacity, exacerbate flooding and change flood patterns...Willows encroaching into the centre of streams interrupt the flow of water which results in stream flows being directed into watercourse banks, causing erosion.” (Purtle, 2001b). Whilst risk of floods and erosion may cause decrease in land value in some incidences, with a state wide view, this is likely to be negligible.	L	MH
22. Change land use?	Willows are associated with waterways and not recorded as invaders of pasture or crops in the extensive literature. Whilst control may be required (see Q. 23) there is little risk that land use would need to change as a consequence of their invasion of agricultural land.	L	H
23. Increase harvest costs?	<i>S. x pendulina</i> tend to be confined to riverbanks (Carr, 1996), which makes them unlikely to impact on agriculture.	L	MH
24. Disease host/vector?	Not found in the extensive literature.	L	H

References cited:

Agriculture & Resource Management Council of Australia & New Zealand (ARMCANZ) 2001, *Weeds of National Significance Willow (Salix taxa, excluding S. babylonica, S. x calodendron and S. x reichardtii) Strategic Plan*, National Weeds Strategy Executive Committee, Launceston.

Aiken SG, Dallwitz MJ, Consaul LL, McJannet CL, Gillespie LJ, Boles RL, Argus GW, Gillett JM, Scott PJ, Elven R, LeBlanc MC, Brysting AK & Solstad H 1999, *Flora of the Canadian Arctic Archipelago: Descriptions, Illustration, Identification, and Information Retrieval*, Memorial University of Newfoundland, viewed: 16/02/2006, www.mun.ca/biology/delta/acrtic/_ca/www/wl.htm.

Bailey LH & Bailey LZ 1976 *Hortus Third*, Macmillan, New York & London.

Besaans (ed.) 1995, *Plant Protection News* vol. 47, pp. 20-24.

Carcaillet C, Bergeron Y, Richard PJH, Frechette B, Gauthier S & Prairie YT 2001 ‘Change of fire frequency in the eastern Canadian boreal forests during the Holocene: does vegetation composition or climate trigger the fire regime?’ *Journal of Ecology*, vol. 89, p. 930-946.

Carr GW 1996, ‘Salix,’ in Walsh NG & Entwistle TJ (Eds.), *Flora of Victoria*, Vol. 3, Inkata Press, Melbourne.

Carr, GW, Yagovic, JV & Robinson, KE 1992, *Environmental Weed Invasions in Victoria*, Department of Conservation and Environment, Vic.

Impact Assessment Record

Scientific Name: *Salix x pendulina*

Common name: Willows

- Cody WJ 1996, *Flora of the Yukon Territory*, NRC Research Press, Ottawa.
- Cremer KW 1995, *Willow Identification for river management in Australia*, CSIRO Division of Forestry, Orange, NSW.
- Cremer K 1999 *Willow Management for Australian Rivers* CSIRO Forestry and Forest Products, Kingston ACT.
- Cremer, K 2001 *Exterminate Wild Pussy Willows and its most invasive relative,s* CSIRO Forestry and Forest Products, Kingston ACT.
- Crouch RJ & Honeyman MN 1986, 'The relative salt tolerance of willow cuttings,' *Journal of Soil Conservation*, vol 42(2), p. 103-104.
- Davis PH 1982, *Flora of Turkey and the east Aegean Islands, Vol. 7*, Edinburgh Uni Press, Edinburgh.
- Fircks HA von, Daurin A (ed.), Junttila O (ed.), Nilsen J 1985 'Frost hardiness of fast-growing *Salix* species,' *Plant production in the north. Proceeding from 'Plant adaptation workshop*,' Norway.
- Haines A 2004 *Salix myrcooides (bayberry willow) Conservation and Research Plan for New England*, New England Flower Society, Framingham, Massachusetts, USA.
- Henderson L 1991 'Alien invasive *Salix* spp. (willows) in the grassland biome of South Africa,' *South African Forestry Journal*, vol. 157, p. 91-95.
- Hitchcock CL & Cronquist A 1964, *Vascular Plants of the Pacific Northwest (Part 2)*, University of Washington Press, Seattle & London.
- Howard RA 1988, *Flora of the Lesser Antilles*, Vol. 4, Arnold Arboretum, Harvard Uni, Jamaica Plain, Massachusetts.
- Holm L et al 1979, *A geographical atlas of world weeds*, Wiley, New York.
- Kennedy SA, Ganf FF & Walker KF 2003, 'Does salinity influence the distribution of exotic willows (*Salix* spp.) along the Lower River Murray?' *Marine and Freshwater Research*, vol 54, p. 825-831.
- Ladson A, Gerrish G, Carr G, Thexton E 1997, *Willows Along Victorian Waterways*, Waterways Unit, Department of Natural Resources and Environment, Vic, Australia.
- Maloney RF, Keedwell, RJ, Wells NJ, Reergen AL & Nilsson RG 1999, 'Effect of willow removal on habitat use by five birds of braided rivers, MrKenzie Basin, New Zealand, *New Zealand Journal of Ecology*, Vol. 23, P. 53-60.
- Meikle RD 1984, *Willows and Poplars of Great Britain and Ireland*, Botanical Society of the British Isles, London.
- Munz PA & Keck DD 1963, *A California Flora*, University of California Press, Berkley & LA.
- Muyt A 2001, *Bush invaders of South-East Australia*, RG and FJ Richardson, Meredith, Vic.
- Newsholme C 1992, *Willows: The genus Salix*, Tumber Press, Portland & Oregon.
- Purtle C, Stelling F, Martin D, Grossman T, Frankenberg J, Campbell S & Dwyer C 2001a *Willow Identification Guide*, Department of Land and Water Conservation,
- Purtle C, Stelling F, Martin D, Grossman T, Frankenberg J, Campbell S & Dwyer C 2001b *Willows along watercourses: an introduction*, Department of Land and Water Conservation,
- Purtle C, Stelling F, Martin D, Grossman T, Frankenberg J, Campbell S & Dwyer C 2001c Department of Land and Water Conservation,
- Shafroth PB, Scott ML & Friedman JM 1994, 'Establishment, sex structure & breeding system of an exotic riparian willow, *Salix x rubens*,' *American Midland Naturalist*, vol. 132, p. 159-172.
- Srutek M, Bauer V, Klimes L & Pinosova J 1988, 'Ecology of economically important plants in the river Luznice floodplain,' *Sbornik Vysoka Skola Zemedelska*, Vol. 5(2), p. 105-118.
- Standley PC & Steyermark JA 1958, *Flora of Guatemala, Vol. 24*, Chicago Natural History Museum, USA.
- Swift CE 1997, *Colorado State University Cooperative Extension*, Colorado State University, viewed: 15/02/2006, www.colostate.edu/Depts/CoopExt/TRA/PLANTS/stable.html.
- Uchytel, RJ 1989, Fire Effects Information System, U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory, viewed: 16/02/2006, www.fs.fed.us/database/feis/plants/tree/salnig/all.html.

Impact Assessment Record

Scientific Name: *Salix x pendulina*

Common name: Willows

United States Department of Agriculture (USDA) 2006 USDA Plants Database, Washington, viewed: 16/02/2006,
http://plants.nrcs.usda.gov/cgi_bin/topics.cgi?earl=characteristics.html.

Voss EG 1972, *Michigan Flora: A guide to the identification and occurrence of the native and naturalized seed plants of the state*, Crabrook Institute of Science, University of Michigan Herbarium, Michigan.

Walters SM et al (eds) 1989, *The European Garden Flora*, Cambridge University Press, UK.

Webb CJ, Sykes WR, Garnock-Jones PJ 1988, *Flora of New Zealand*, vol. 4, Manaaki Whenua Press, NZ

Zallar S nd, *Botanical Characteristics of the Willows*, Soil Conservation Authority, Kew.

Revisions

Date	Revised by	Revision

ⁱ Weiss, J. Project Leader, Pest Plant Impact Assessment. DPI, Frankston. Tel 9785 0111. (11/07/03)

ⁱⁱ Weiss, J. Project Leader, Pest Plant Impact Assessment. DPI, Frankston. Tel 9785 0111. (11/07/03)

Invasiveness Assessment Record

Scientific name: *Salix x rubens*

Common Name: Willows

QUESTION	COMMENTS	RATING	CONFIDENCE
Establishment			
1. Germination requirements?	“The ‘fragility’...of willows varies greatly and this is the single most important attribute conferring invasibility...by vegetative means.” The most fragile taxa include: <i>Salix fragilis</i> , <i>S. x rubens</i> , <i>S. x pendulina</i> , <i>S. alba</i> , <i>S. x sepulcralis</i> , and <i>S. matsudana</i> ‘ <i>Torulosa</i> ’. They take root where they lodge in water or on wet ground (Ladson et al, 1997)ie. Opportunistic species.	H	MH
2. Establishment requirements?	Willows are described as heliophyllic (intolerant of shade) (Haines, 2004) and most species ...must not be overhung by larger plants or trees (Newsholme, 1992).	ML	MH
3. How much disturbance is required?	<i>S. x rubens</i> establish predominantly vegetatively (Ladson et al, 1997) and as such tend to “invade riverbanks, lakesides, drainage channels, swaps, almost all wet places (Webb, Sykes & Garnock-Jones, 1988) that are, by their nature, disturbed ecosystems.	MH	MH
Growth/Competitive			
4. Life form?	Semi-aquatic- All willows are described as growing on the banks of water courses or in moist locations. <i>S. x rubens</i> grows in riverbeds (Webb, Sykes & Garnock-Jones, 1988). Abundant along streams (Carr, 1996).	H	MH
5. Allelopathic properties?	Of the naturalised willows in Australia, allelopathic compounds have been demonstrated in <i>S. rubra</i> (Bokarev, Kefeli & Kapeljusnikova, 1966), <i>S. babylonica</i> (Koul et al, 1991), <i>S. fragilis</i> (Davison, 1965), <i>S. viminalis</i> (Bowen & Hoad, 1968), <i>S. alba</i> (Banzhaf et al, 1983) and <i>S. purpurea</i> (Gilliver, 1947). For other willow species , their “dense shade and mat-forming willow roots suppress and kill indigenous understorey” (Purtle et al, 2001b), suggesting that there might be an allelopathic basis for this lack of understorey beneath willow infestations, however no specific reference to these species was found.	M	L
6. Tolerates herb pressure?	Some <i>Salix</i> species provide good fodder for both ruminants and horses...particularly in Australia (Newsholme, 1992). However, many species tolerate this grazing and/or are able to resprout from stump, eg. <i>S. cinerea</i> (Cremer, 1999), <i>S. x rubens</i> (Shafroth et al, 1994), <i>S. viminalis</i> (Newsholme, 1992), <i>S. exigua</i> (Uchytel, 1989).	MH	MH
7. Normal growth rate?	“ <i>Salix</i> are fast growing trees or shrubs, rarely prostrate” (Spencer, 1997). Where growth rates are described, tree and shrub forms of <i>Salix</i> are recorded as vigorous or fast growing, eg. <i>S. alba</i> (Spencer, 1997), <i>S. glaucophylloides</i> (Newsholme, 1992), <i>S. nigra</i> (Cremer, 1995), <i>S. purpurea</i> (Webb, Sykes & Garnock-Jones, 1988) and <i>S. x rubens</i> (Meikle).	H	MH

Invasiveness Assessment Record

Scientific name: *Salix x rubens*

Common Name: Willows

QUESTION	COMMENTS	RATING	CONFIDENCE
8. Stress tolerance to frost, drought, w/logg, sal. etc?	FIRE “If a tree is completely girdled by fire at ground level it may die without coppicing...however young trees tend to sprout from the buried portion of their stem” (Cremer, 1999), indicating some fire tolerance in tree and shrub willows in general. FROST All tree and shrub species (except <i>S. humboldtiana</i>) in this study are recorded as tolerating USDA hardiness zones of between 1 and 6 (average minimum temperatures between –46C and –17C) (Bailey & Bailey, 1976, Griffiths, 1992). <i>S. humboldtiana</i> is susceptible to frost (Newsholme, 1992). DROUGHT All willows are described as growing on the banks or in the riverbeds of water courses or in moist locations (Carr, 1996; Carr et. al, 1992; Cody, 1996; Davis, 1982; Howard, 1988; Ladson, et al, 1997; Maloney et al, 1999; Munz, 1963; Voss, 1972; Webb, Sykes & Garnock-Jones, 1988) suggesting a low drought tolerance; and only few species (<i>S. cinerea</i> and <i>S. exigua</i>) can also establish on drier soil (but are not necessarily drought tolerant), with <i>S. purpurea</i> alone tolerating extremely dry, sandy soils (Newsholme, 1992). WATERLOGGING Those species able to grow in riverbeds must have high tolerance of waterlogging (<i>S. exigua</i>, Cody, 1996; <i>S. fragilis</i>, Maloney et al, 1999; <i>S. alba</i>, <i>S.x rubens</i>, and <i>S. viminalis</i>; Webb, Sykes & Garnock-Jones, 1988) and also <i>S. cinerea</i> (Cremer, 1999). SALINITY <i>S. alba</i> is “the most tolerant of all willows to brackish water” (Zallar). <i>S. cinerea</i> “tolerates salt-laden air” (Newsholme, 1992), <i>S. fragilis</i>, <i>S. matsudana</i> & <i>S. seringeana</i> tolerate high levels of salinity (Crouch & Honeyman, 1986). <i>S. nigra</i> has moderately high tolerance of salt (Swift, 1997) and <i>S. purpurea</i> shows “considerable tolerance for salt water” (Newsholme, 1992). <i>S. x rubens</i> are highly tolerant of frost, have some tolerance of fire, and are highly tolerant of <i>either</i> waterlogging <i>or</i> salinity, but not of drought.	MH	MH
Reproduction			
9. Reproductive system	<i>S. x rubens</i> branchlets rather brittle (Webb, Sykes & Garnock-Jones, 1988). It produces abundant viable seed (Cremer, 1995). Often reproduces vegetatively (Shafroth et al, 1994). Capable of reproducing both vegetatively and by seed.	H	MH
10. Number of propagules produced?	“A large crown would produce over 500 000 seeds (Cremer, 1999). Seeds numerous, very small, each with a tuft of long hairs (Tutin, 1993).	H	MH
11. Propagule longevity?	“Willow seed is very short-lived” with longer-lived species recorded at surviving 8-10 weeks (Cremer, 1999).	L	MH
12. Reproductive period?	Following reproductive maturity “flowering tends to be ample and to occur every year” (Cremer, 1999). <i>S. cinerea</i> “stands are mostly monoculture excluding 97% of sunlight and most other species” (Cremer, 1999). The oldest stem <i>S. exigua</i> in this study was 31 years (Ottenbreit & Staniforth, 1992). An old <i>S. fragilis</i> tree was observed to 130 years (Meikle, 1984).	H	MH
13. Time to reproductive maturity?	“Flowering and the production of viable seed may begin two to three years after germination, provided the plant is at least 1m tall if it is a shrub willow, or 2m tall if it is a tree willow...In some taxa (eg. <i>S. alba</i>) flowering tends to begin at larger sizes” (Cremer, 1999), which is probably still within 5 years.	ML	MH

Invasiveness Assessment Record

Scientific name: *Salix x rubens*

Common Name: Willows

QUESTION	COMMENTS	RATING	CONFIDENCE
	For plants that have reproduced vegetatively, this may be reduced, as in <i>S. nigra</i> , observed flowering on cuttings produced from < 1 year old growth (Crouch & Honeyman, 1986).		
Dispersal			
14. Number of mechanisms?	Vegetative propagules and seed spread by water. "Seed is easily carried by wind" (Cremer, 1999).	H	MH
15. How far do they disperse?	In species where vegetative reproduction predominates:), <i>S. x chrysocoma</i> (Cremer, 1995), <i>S. fragilis</i> , <i>S. alba</i> , <i>S. humboldtiana</i> , <i>S. matsudana</i> , <i>S. x pendulina</i> & <i>S. x sepulcralis</i> (ARMCANZ, 2001), <i>S. x rubens</i> provides evidence that "very few individuals observed long distances from existing mature trees and these were downstream of cities, towns and homesteads" (Shafroth et al, 1994).	MH	MH

References cited:

- Agriculture & Resource Management Council of Australia & New Zealand (ARMCANZ) 2001, *Weeds of National Significance Willow (Salix taxa, excluding S. babylonica, S. x calodendron and S. x reichardtii) Strategic Plan*, National Weeds Strategy Executive Committee, Launceston.
- Bahnzaf R, Kranzle M, Muhle H & Winkler S 1983, 'Effect of leaf leachates on nitrogen mineralization [German],' *Verhandlungen der Gesellschaft fur Okologie*, vol. 10, p. 63-70.
- Bailey LH & Bailey LZ 1976 *Hortus Third*, Macmillan, New York & London.
- Besaans (ed.) 1995, *Plant Protection News* vol. 47, pp. 20-24.
- Bokarev KS, Kefeli VI & Kapeljusnikova LM 1966, 'Chemical and physiological properties of natural inhibitors from *Salix rubra* [Russian],' *Fizio. Rast.*, Vol. 13(2), p. 274-282.
- Bowen MR & Hoad GV 1968, 'Inhibitor content of phloem and xylem sap obtained from willow (*Salix viminalis*) entering dormancy,' *Planta.*, vol 81(1), p. 64-70.
- Carcaillet C, Bergeron Y, Richard PJH, Frechette B, Gauthier S & Prairie YT 2001 'Change of fire frequency in the eastern Canadian boreal forests during the Holocene: does vegetation composition or climate trigger the fire regime?' *Journal of Ecology*, vol. 89, p. 930-946.
- Carr GW 1996, 'Salix,' in Walsh NG & Entwisle TJ (Eds.), *Flora of Victoria*, Vol. 3, Inkata Press, Melbourne.
- Carr, GW, Yogovic, JV & Robinson, KE 1992, *Environmental Weed Invasions in Victoria*, Department of Conservation and Environment, Vic.
- Cody WJ 1996, *Flora of the Yukon Territory*, NRC Research Press, Ottawa.
- Cremer KW 1995, *Willow Identification for river management in Australia*, CSIRO Division of Forestry, Orange, NSW.
- Cremer K 1999 *Willow Management for Australian Rivers* CSIRO Forestry and Forest Products, Kingston ACT.
- Cremer, K 2001 *Exterminate Wild Pussy Willows and its most invasive relative,s* CSIRO Forestry and Forest Products, Kingston ACT.
- Cremer K 2003 'Introduced willows can become invasive pests in Australia,' *Biodiversity*, Vol. 4(4), p. 17-24.
- Cremer K, Van Kraayenoord C, Parker N & Streatfield S 1995, 'Willows spreading by seed,' *Australian Journal of Soil and Water Conservation*, Vol 8 (4), p. 18-27.
- Crouch RJ & Honeyman MN 1986, 'The relative slat tolerance of willow cuttings,' *Journal of Soil Conservation*, vol 42(2), p. 103-104.
- Davis PH 1982, *Flora of Turkey and the east Aegean Islands*, Vol. 7, Edinburgh Uni Press, Edinburgh.
- Davison RM 1965, 'Some properties of a plant growth inhibitor present in xylem sap of woody species,' *Australian Journal of Biological Sciences*, vol. 18(3), p. 475-486.

Invasiveness Assessment Record

Scientific name: *Salix x rubens*

Common Name: Willows

- Fircks HA von, Daurin A (ed.), Junttila O (ed.), Nilsen J 1985 'Frost hardiness of fast-growing *Salix* species,' *Plant production in the north. Proceeding from 'Plant adaptation workshop,'* Norway.
- Gilliver K 1947, 'The effect of plant extracts on the germination of the conidia of *Venturia inaequalis*,' *Ann. Appl. Biol.*, vol. 34(1), p. 136-143.
- Griffiths M 1992, *The New Royal Horticultural Society dictionary of gardening*, vol. 4, Macmillan, London.
- Haines A 2004 *Salix myricoides (bayberry willow) Conservation and Research Plan for New England*, New England Flower Society, Framingham, Massachusetts, USA.
- Henderson L 1991 'Alien invasive *Salix* spp. (willows) in the grassland biome of South Africa,' *South African Forestry Journal*, vol. 157, p. 91-95.
- Hitchcock CL & Cronquist A 1964, *Vascular Plants of the Pacific Northwest (Part 2)*, University of Washington Press, Seattle & London.
- Howard RA 1988, *Flora of the Lesser Antilles*, Vol. 4, Arnold Arboretum, Harvard Uni, Jamaica Plain, Massachusetts.
- Holm L et al 1979, *A geographical atlas of world weeds*, Wiley, New York.
- Koul VK, Raina A, Dhanna YP, Tickoo ML & Singh 1991, 'Evaluation of allelopathic influence of certain farm grown tree species on rice (*Oryza sativa* L. c.v. PC 19),' *Indian Journal of Forestr.*, vol. 14(1), p. 54-57.
- Ladson A, Gerrish G, Carr G, Thexton E 1997, *Willows Along Victorian Waterways*, Waterways Unit, Department of Natural Resources and Environment, Vic, Australia.
- Maloney RF, Keedwell, RJ, Wells NJ, Reergen AL & Nilsson RG 1999, 'Effect of willow removal on habitat use by five birds of braided rivers, MrKenzie Basin, New Zealand, *New Zealand Journal of Ecology*, Vol. 23, P. 53-60.
- Meikle RD 1984, *Willows and Poplars of Great Britain and Ireland*, Botanical Society of the British Isles, London.
- Munz PA & Keck DD 1963, *A California Flora*, University of California Press, Berkeley & LA.
- Newsholme C 1992, *Willows: The genus Salix*, Tumber Press, Portland & Oregon.
- Ottensbreit KA & Staniforth JR 1992, 'Life cycle and age structure of ramets in an expanding population of *Salix exigua* (sandbar willow),' *Canadian Journal of Botany*, vol. 70(6), p. 1141-1146.
- Purtle C, Stelling F, Martin D, Grossman T, Frankenberg J, Campbell S & Dwyer C 2001a *Willow Identification Guide*, Department of Land and Water Conservation, NSW.
- Purtle C, Stelling F, Martin D, Grossman T, Frankenberg J, Campbell S & Dwyer C 2001b *Willows along watercourses: an introduction*, Department of Land and Water Conservation, NSW.
- Purtle C, Stelling F, Martin D, Grossman T, Frankenberg J, Campbell S & Dwyer C 2001c Department of Land and Water Conservation, NSW.
- Shafroth PB, Scott ML & Friedman JM 1994, 'Establishment, sex structure & breeding system of an exotic riparian willow, *Salix x rubens*,' *American Midland Naturalist*, vol. 132, p. 159-172.
- Spencer R 1997, *Horticultural Flora of South-Eastern Australia*, vol. 2, UNSW Press, Australia.
- Strutek M, Bauer V, Klimes L & Pinosova J 1988, 'Ecology of economically important plants in the river Lutzna floodplain,' *Sbornik Vysoka Skola Zemelska*, Vol. 5(2), p. 105-118.
- Standley PC & Steyermark JA 1958, *Flora of Guatemala*, Vol. 24, *Chicago Natural History Museum*, USA.
- Swift CE 1997, *Colorado State University Cooperative Extension*, Colorado State University, viewed: 15/02/2006, www.colostate.edu/Depts/CoopExt/TRA/PLANTS/stable.html.
- Tutin TG 1993, *Flora Europaea*, University Press, Cambridge.
- Uchytel, RJ 1989, Fire Effects Information System, U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory, viewed: 10/01/2000, <http://www.fs.fed.us/database/feis/plants/tree/salex/atl.html>.

Invasiveness Assessment Record

Scientific name: *Salix x rubens*

Common Name: Willows

Voss EG 1972, *Michigan Flora: A guide to the identification and occurrence of the native and naturalized seed plants of the state*, Crabrook Institute of Science, University of Michigan Herbarium, Michigan.

Walters SM et al (eds) 1989, *The European Garden Flora*, Cambridge University Press, UK.

Webb, Sykes & Garnock-Jones, 1988 CJ, Sykes WR, Garnock-Jones PJ 1988, *Flora of New Zealand*, vol. 4, Manaaki Whenua Press, NZ

Zallar S nd, *Botanical Characteristics of the Willows*, Soil Conservation Authority, Kew.

S. cinerea, S. fragilis, S. x rubens & S. nigra are identified by Ladson et al as outstandingly invasive because of their biology and ecology, specifically their reproductive ability.

Revisions

Date

Revised by

Revision

Present distribution of *Salix x rubens* in Victoria

Scientific name: *Salix x rubens* Schrank

Common name(s): white crack willow

Status:

Habitat:

Native to Europe. Found in riparian areas along streambanks and river margins. Also found on agricultural reservoir banks (Westhus 1986).



Potential distribution of *Salix x rubens* in Victoria

Scientific name: *Salix x rubens* Schrank

Common name(s): white crack willow

Status:

Habitat:

Native to Europe. Found in riparian areas along streambanks and river margins. Also found on agricultural reservoir banks (Westhus 1986).

Potential distribution produced from CLIMATE modelling refined by applying suitable landuse and vegetation type overlays with CMA boundaries

MAP OVERLAYS USED.

Land Use:

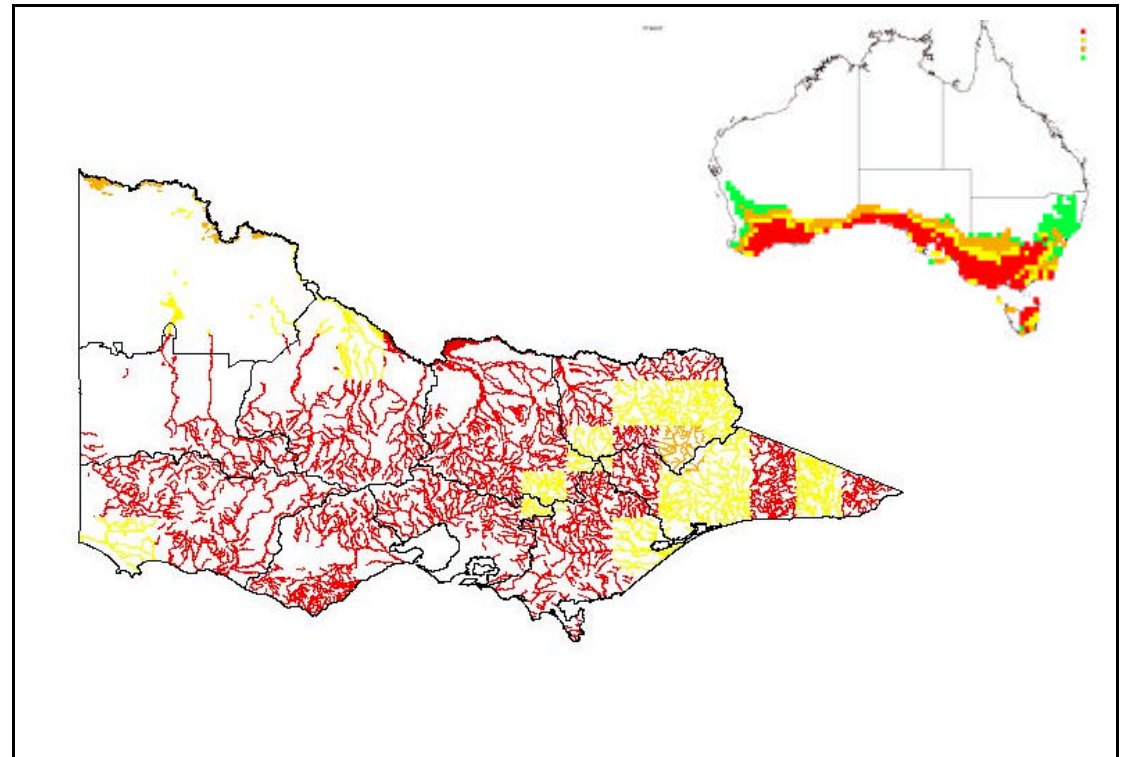
Broad vegetation types

Swamp scrub; riverine grassy woodland; riparian forest

Colours indicate possibility of *Salix x rubens* infesting these areas.

 Red	= Very high	 Yellow	= High
 Orange	= Medium	 Green	= Likely

In the non-coloured areas the plant is unlikely to establish as the climate, soil or landuse is not presently suitable.



Impact Assessment Record

Scientific Name: *Salix x rubens*

Common name: Willows

QUESTION	COMMENTS	RATING	CONFIDENCE
Social			
1. Restrict human access?	Willows can form dense thickets several metres thick, with densely spaced stems (FEIS, 2000) that could be major impediments to access waterways. <i>S. x rubens</i> is a thicket-forming species (Cremer, 1995). It is also able to grow in streambeds (Webb, Sykes & Garnock-Jones, 1988) and has extensive roots, which can grow out into the stream (Cremer, 1995) “trapping silt and layering new roots over the top of the old ones...creating a broad shallow stream” (Ladson et al, 1997) that can block the access of boats.	H	MH
2. Reduce tourism?	<i>S. x rubens</i> has roots that encroach into streams (Cremer, 1995), trapping silt and reducing channel capacity can also create a shallow stream (Ladson et al, 1997) that boats and swimmers can no longer use.	H	
3. Injurious to people?	No reference to human injury found in any reference. Toxicity rated as ‘none’ for the species summarised in the USDA Plants Database (2006) including <i>S. purpurea</i> , <i>S. exigua</i> , <i>S. nigra</i> , <i>S. xsepulcralis</i> , <i>S. alba</i> . Presume no toxicity for any <i>Salix</i> .	L	MH
4. Damage to cultural sites?	As semi-aquatic species, confined to stream banks or beds or moist locations (Carr, 1996; Carr et al, 1992; Cody, 1996; Davis, 1982; Howard, 1988; Ladson et al, 1997; Maloney et al, 1999; Munz, 1963; Voss, 1972; Webb, Sykes & Garnock-Jones, 1988) willows are unlikely to grow near enough to cause structural or visual damage to cultural sites. However, during floods, senescent trees can drop large branches or trunks into waterways and a build up of material behind these snags can destroy bridges (ARMCANZ, 2001). Major damage to buildings can occur when streams change route because they have become clogged with mats of willow roots. A Tasmanian Landcare group was formed in response to flooded homes, the cause of which was attributed to stream blockages by willow roots encroaching into streams (Sarah Holland-Clift pers. comm.).	H	MH
Abiotic			
5. Impact flow?	As <i>S.x rubens</i> is able to grow in streambeds (Webb, Sykes & Garnock-Jones, 1988), it can have serious impacts both to surface and subsurface water flow. “Fibrous willow roots and dense willow foliage trap large amounts of silt which can decrease channel capacity, exacerbate flooding and change flood patterns. Willow roots can grow out into the stream, trapping silt and layering new roots over old roots, building up the streambed and creating a broad shallow stream” (Purtle et al, 2001b).	H	MH
6. Impact water quality?	As deciduous plants (Carr, 1996), all shrub and tree willows have mass autumn leaf fall, which leads to decreased oxygen levels (Ladson et al, 1997). Intense shading by willows, which tend to have more dense canopies than native species decreases water temperature (Ladson et al, 1997).	H	MH

Impact Assessment Record

Scientific Name: *Salix x rubens*

Common name: Willows

QUESTION	COMMENTS	RATING	CONFIDENCE
7. Increase soil erosion?	“Willows encroaching into the centre of streams interrupt the flow of water which results in stream flows being directed into watercourse banks, causing erosion. In severe cases, willows can create complete blockages, causing the stream to change course (Purtle, 2001b). <i>S. x rubens</i> is capable of encroaching into streams (Webb, Sykes & Garnock-Jones, 1988).	H	MH
8. Reduce biomass?	As woody plants that can form dense thickets, or large shrubs or trees (Carr, 1996), willows are capable of increasing biomass where they replace lower or less dense vegetation as they commonly do in disturbed sites (Cremer, 1999).	L	MH
9. Change fire regime?	Willows are low flammable/combustible trees (Carcaillet et al, 2001), likely to greatly change the frequency and intensity of fire risk.	H	H
Community Habitat			
10. Impact on composition (a) high value EVC	River Basin=East Gippsland-Cann River (ISC=Excellent); CMA=East Gippsland; CLIMATE=VH. <i>S. x rubens</i> is “abundant along streams...a very serious environmental weed...Very widespread and common...The most abundant <i>Salix</i> in [Victoria]” Carr, 1996). It forms a significant component of the overstorey in high plains riparian areas that it invades (Shafroth et al, 1994). Displaces all species within a layer.	H	MH
(b) medium value EVC	All Victorian water bodies considered to comprise high value EVCs only (Weiss pers. coms.).	L	H
(c) low value EVC	All Victorian water bodies considered to comprise high value EVCs only (Weiss pers. coms.).	L	H
11. Impact on structure?	<i>S. x rubens</i> is “abundant along streams...a very serious environmental weed...Very widespread and common...The most abundant <i>Salix</i> in [Victoria]” Carr, 1996). It forms a significant component of the overstorey in high plains riparian areas that it invades (Shafroth et al, 1994). Capable of having a major effect on all layers of native vegetation.	H	MH
12. Effect on threatened flora?	No information found.	MH	L
Fauna			
13. Effect on threatened fauna?	No information found.	MH	L
14. Effect on non-threatened fauna?	Intense shading decreases primary production in waterways, impacting on invertebrates and fish (Ladson et al, 1997). Reduce indigenous vegetation which would otherwise provide habitat (especially tree hollows) and pollen and nectar food sources (Ladson, 1997) “Dense shade and mat-forming willow roots suppress and kill indigenous understorey [which is] important habitat for insects, birds and mammals. Bare banks beneath willows provide little protection for frogs,	MH	MH

Impact Assessment Record

Scientific Name: *Salix x rubens*

Common name: Willows

QUESTION	COMMENTS	RATING	CONFIDENCE
	water rats, snakes, lizards and other fauna. Willows do not provide nectar for native birds...Willows also have few hollows, important habitat for over half of our woodland birds and mammals" (Purtle et al, 2001b). Reduction in habitat for fauna, leading to reduction in numbers of individuals but not to local extinction.		
15. Benefits fauna?	Possums graze and defoliate isolated trees (ARMCANZ, 2001). <i>S. exigua</i> "stands provide excellent cover for numerous wildlife species" in America (FEIS, 2000). <i>S. x rubens</i> is a thicket-forming species (Cremer, 1995) that might also provide habitat.	MH	MH
16. Injurious to fauna?	No reference to animal injury found in any reference.	L	H
Pest Animal			
17. Food source to pests?	The palatability of other species is unknown.	M	L
18. Provides harbor?	<i>S. exigua</i> "stands provide excellent cover for numerous wildlife species" (FEIS, 2000). <i>S. x rubens</i> is another thicket-forming species (Cremer, 1995) that might harbour foxes and rabbits.	H	MH
Agriculture			
19. Impact yield?	Species present as agricultural weeds: <i>S. alba</i> in NZ and USA, <i>S. babylonica</i> and <i>S. cinerea</i> in NZ, <i>S. exigua</i> in USA, <i>S. nigra</i> in USA and <i>S. fragilis</i> is a principal agricultural weed in NZ (Holm et al, 1979). As willows are associated with waterways and not recorded as invaders of pasture or crops, their ability to form dense thickets that impede access to waterways for irrigation is likely to be the only impact they have on agriculture. Willow root mats reduce access to flowing water for irrigation purposes (Sarah Holland-Clift pers. comm.). <i>S. x rubens</i> is a thicket-forming (Cremer, 1995) and instream species (Webb, Sykes & Garnock-Jones, 1988) which may reduce access to waterways for irrigation. They are likely to have a minor impact on the quantity of produce.	ML	MH

Impact Assessment Record

Scientific Name: *Salix x rubens*

Common name: Willows

QUESTION	COMMENTS	RATING	CONFIDENCE
20. Impact quality?	Generally willows are valued for shade and browsing for livestock (Besaans, 1995).	L	MH
21. Affect land value?	“Fibrous willow roots and dense willow foliage trap large amounts of silt which can decrease channel capacity, exacerbate flooding and change flood patterns...Willows encroaching into the centre of streams interrupt the flow of water which results in stream flows being directed into watercourse banks, causing erosion.” (Purtle, 2001b). Whilst risk of floods and erosion may cause decrease in land value in some incidences, with a state wide view, this is likely to be negligible.	L	MH
22. Change land use?	Willows are associated with waterways and not recorded as invaders of pasture or crops in the extensive literature. Whilst control may be required (see Q. 23) there is little risk that land use would need to change as a consequence of their invasion of agricultural land.	L	H
23. Increase harvest costs?	Some willow control to maintain waterways for irrigation may increase harvest costs by a minor amount. This is likely to be for the thicket-forming species and those able to grow instream such as <i>S. x rubens</i> (Cremer, 1995; Webb, Sykes & Garnock-Jones, 1988). In the Jerilderie area 80% of farmers are donating a rebate to fund a project manager for willows in Yanco Creek, because their root mats reduce access to creek water for irrigation (Sarah Holland-Clift).	MH	MH
24. Disease host/vector?	Not found in the extensive literature.	L	H

References cited:

Agriculture & Resource Management Council of Australia & New Zealand (ARMCANZ) 2001, *Weeds of National Significance Willow (Salix taxa, excluding S. babylonica, S. x calodendron and S. x reichardtii) Strategic Plan*, National Weeds Strategy Executive Committee, Launceston.

Aiken SG, Dallwitz MJ, Consaul LL, McJannet CL, Gillespie LJ, Boles RL, Argus GW, Gillett JM, Scott PJ, Elven R, LeBlanc MC, Brysting AK & Solstad H 1999, *Flora of the Canadian Arctic Archipelago: Descriptions, Illustration, Identification, and Information Retrieval*, Memorial University of Newfoundland, viewed: 16/02/2006, www.mun.ca/biology/delta/arctic/_ca/www/wl.htm.

Bailey LH & Bailey LZ 1976 *Hortus Third*, Macmillan, New York & London.

Besaans (ed.) 1995, *Plant Protection News* vol. 47, pp. 20-24.

Carcaillet C, Bergeron Y, Richard PJH, Frechette B, Gauthier S & Prairie YT 2001 ‘Change of fire frequency in the eastern Canadian boreal forests during the Holocene: does vegetation composition or climate trigger the fire regime?’ *Journal of Ecology*, vol. 89, p. 930-946.

Carr GW 1996, ‘Salix,’ in Walsh NG & Entwisle TJ (Eds.), *Flora of Victoria*, Vol. 3, Inkata Press, Melbourne.

Carr, GW, Yagovic, JV & Robinson, KE 1992, *Environmental Weed Invasions in Victoria*, Department of Conservation and Environment, Vic.

Cody WJ 1996, *Flora of the Yukon Territory*, NRC Research Press, Ottawa.

Cremer KW 1995, *Willow Identification for river management in Australia*, CSIRO Division of Forestry, Orange, NSW.

Cremer K 1999 *Willow Management for Australian Rivers* CSIRO Forestry and Forest Products, Kingston ACT.

Cremer, K 2001 *Exterminate Wild Pussy Willows and its most invasive relative,s* CSIRO Forestry and Forest Products, Kingston ACT.

Crouch RJ & Honeyman MN 1986, ‘The relative salt tolerance of willow cuttings,’ *Journal of Soil Conservation*, vol 42(2), p. 103-104.

Impact Assessment Record

Scientific Name: *Salix x rubens*

Common name: Willows

- Davis PH 1982, *Flora of Turkey and the east Aegean Islands*, Vol. 7, Edinburgh Uni Press, Edinburgh.
- Fircks HA von, Daurin A (ed.), Junttila O (ed.), Nilsen J 1985 'Frost hardiness of fast-growing *Salix* species,' *Plant production in the north. Proceeding from 'Plant adaptation workshop*, ' Norway.
- Haines A 2004 *Salix myrcoides (bayberry willow) Conservation and Research Plan for New England*, New England Flower Society, Framingham, Massachusetts, USA.
- Henderson L 1991 'Alien invasive *Salix* spp. (willows) in the grassland biome of South Africa,' *South African Forestry Journal*, vol. 157, p. 91-95.
- Hitchcock CL & Cronquist A 1964, *Vascular Plants of the Pacific Northwest (Part 2)*, University of Washington Press, Seattle & London.
- Howard RA 1988, *Flora of the Lesser Antilles*, Vol. 4, Arnold Arboretum, Harvard Uni, Jamaica Plain, Massachusetts.
- Holm L et al 1979, *A geographical atlas of world weeds*, Wiley, New York.
- Kennedy SA, Ganf FF & Walker KF 2003, 'Does salinity influence the distribution of exotic willows (*Salix* spp.) along the Lower River Murray?' *Marine and Freshwater Research*, vol 54, p. 825-831.
- Ladson A, Gerrish G, Carr G, Thexton E 1997, *Willows Along Victorian Waterways*, Waterways Unit, Department of Natural Resources and Environment, Vic, Australia.
- Maloney RF, Keedwell, RJ, Wells NJ, Reergen AL & Nilsson RG 1999, 'Effect of willow removal on habitat use by five birds of braided rivers, MrKenzie Basin, New Zealand, *New Zealand Journal of Ecology*, Vol. 23, P. 53-60.
- Meikle RD 1984, *Willows and Poplars of Great Britain and Ireland*, Botanical Society of the British Isles, London.
- Munz PA & Keck DD 1963, *A California Flora*, University of California Press, Berkley & LA.
- Muyt A 2001, *Bush invaders of South-East Australia*, RG and FJ Richardson, Meredith, Vic.
- Newsholme C 1992, *Willows: The genus Salix*, Tumber Press, Portland & Oregon.
- Purtle C, Stelling F, Martin D, Grossman T, Frankenberg J, Campbell S & Dwyer C 2001a *Willow Identification Guide*, Department of Land and Water Conservation,
- Purtle C, Stelling F, Martin D, Grossman T, Frankenberg J, Campbell S & Dwyer C 2001b *Willows along watercourses: an introduction*, Department of Land and Water Conservation,
- Purtle C, Stelling F, Martin D, Grossman T, Frankenberg J, Campbell S & Dwyer C 2001c Department of Land and Water Conservation,
- Shafroth PB, Scott ML & Friedman JM 1994, 'Establishment, sex structure & breeding system of an exotic riparian willow, *Salix x rubens*,' *American Midland Naturalist*, vol. 132, p. 159-172.
- Srutek M, Bauer V, Klimes L & Pinosova J 1988, 'Ecology of economically important plants in the river Luznice floodplain,' *Sbornik Vysoka Skola Zemedelska*, Vol. 5(2), p. 105-118.
- Standley PC & Steyermark JA 1958, *Flora of Guatemala*, Vol. 24, Chicago Natural History Museum, USA.
- Swift CE 1997, *Colorado State University Cooperative Extension*, Colorado State University, viewed: 15/02/2006, www.colostate.edu/Depts/CoopExt/TRA/PLANTS/stable.html.
- Uchytel, RJ 1989, Fire Effects Information System, U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory, viewed: 16/02/2006, www.fs.fed.us/database/feis/plants/tree/salnig/all.html.
- United States Department of Agriculture (USDA) 2006 USDA Plants Database, Washington, viewed: 16/02/2006, http://plants.nrcs.usda.gov/cgi_bin/topics.cgi?earl=characteristics.html.
- Voss EG 1972, *Michigan Flora: A guide to the identification and occurrence of the native and naturalized seed plants of the state*, Crabbrook Institute of Science, University of Michigan Herbarium, Michigan.
- Walters SM et al (eds) 1989, *The European Garden Flora*, Cambridge University Press, UK.

Impact Assessment Record

Scientific Name: *Salix x rubens*

Common name: Willows

Webb CJ, Sykes WR, Garnock-Jones PJ 1988, *Flora of New Zealand*, vol. 4, Manaaki Whenua Press, NZ
Zallar S nd, *Botanical Characteristics of the Willows*, Soil Conservation Authority, Kew.

Revisions

Date	Revised by	Revision

Invasiveness Assessment Record

Scientific name: *Salix x sepulcralis* Simonk.*

Common Name: Willows

QUESTION	COMMENTS	RATING	CONFIDENCE
Establishment			
1. Germination requirements?	“The ‘fragility’...of willows varies greatly and this is the single most important attribute conferring invasibility...by vegetative means.” The most fragile taxa include: <i>Salix fragilis</i> , <i>S. x rubens</i> , <i>S. x pendulina</i> , <i>S. alba</i> , <i>S. x sepulcralis</i> , and <i>S. matsudana</i> ‘ <i>Torulosa</i> ’. They take root where they lodge in water or on wet ground (Ladson et al, 1997)ie. opportunistic species.	H	MH
2. Establishment requirements?	Willows are described as heliophyllic (intolerant of shade) (Haines, 2004) and most species ...must not be overhung by larger plants or trees (Newsholme, 1992).	ML	MH
3. How much disturbance is required?	<i>S. x sepulcralis</i> establish predominantly vegetatively (Ladson et al, 1997) and as such tend to “invade riverbanks, lakesides, drainage channels, swaps, almost all wet places (Webb, Sykes & Garnock-Jones, 1988) that are, by their nature, disturbed ecosystems.	MH	MH
Growth/Competitive			
4. Life form?	Semi-aquatic- All willows are described as growing on the banks of water courses or in moist locations. <i>S. x sepulcralis</i> grows along riverbanks and lakesides (Webb, Sykes & Garnock-Jones, 1988).	H	MH
5. Allelopathic properties?	Of the naturalised willows in Australia, allelopathic compounds have been demonstrated in <i>S. rubra</i> (Bokarev, Kefeli & Kapeljusnikova, 1966), <i>S. babylonica</i> (Koul et al, 1991), <i>S. fragilis</i> (Davison, 1965), <i>S. viminalis</i> (Bowen & Hoad, 1968), <i>S. alba</i> (Banzhaf et al, 1983) and <i>S. purpurea</i> (Gilliver, 1947).For other willow species , their “dense shade and mat-forming willow roots suppress and kill indigenous understorey” (Purtle et al, 2001b), suggesting that there might be an allelopathic basis for this lack of understorey beneath willow infestations, however no specific reference to these species was found.	M	L
6. Tolerates herb pressure?	No information	M	L
7. Normal growth rate?	“ <i>Salix</i> are fast growing trees or shrubs, rarely prostrate” (Spencer, 1997). Where growth rates are described, tree and shrub forms of <i>Salix</i> are recorded as vigorous or fast growing, eg. <i>S. alba</i> (Spencer, 1997), <i>S. glaucophylloides</i> (Newsholme, 1992), <i>S. nigra</i> (Cremer, 1995), <i>S. purpurea</i> (Webb, Sykes & Garnock-Jones, 1988) and <i>S. x rubens</i> (Meikle).	H	MH

Invasiveness Assessment Record

Scientific name: *Salix x sepulcralis* Simonk.*

Common Name: Willows

QUESTION	COMMENTS	RATING	CONFIDENCE
8. Stress tolerance to frost, drought, w/logg, sal. etc?	FIRE “If a tree is completely girdled by fire at ground level it may die without coppicing...however young trees tend to sprout from the buried portion of their stem” (Cremer, 1999), indicating some fire tolerance in tree and shrub willows in general. FROST All tree and shrub species (except <i>S. humboldtiana</i>) in this study are recorded as tolerating USDA hardiness zones of between 1 and 6 (average minimum temperatures between –46C and –17C) (Bailey & Bailey, 1976, Griffiths, 1992). <i>S. humboldtiana</i> is susceptible to frost (Newsholme, 1992). DROUGHT All willows are described as growing on the banks or in the riverbeds of water courses or in moist locations (Carr, 1996; Carr et. al, 1992; Cody, 1996; Davis, 1982; Howard, 1988; Ladson, et al, 1997; Maloney et al, 1999; Munz, 1963; Voss, 1972; Webb, Sykes & Garnock-Jones, 1988) suggesting a low drought tolerance; and only few species (<i>S. cinerea</i> and <i>S. exigua</i>) can also establish on drier soil (but are not necessarily drought tolerant), with <i>S. purpurea</i> alone tolerating extremely dry, sandy soils (Newsholme, 1992). All willow species in this study are frost hardy (except <i>S. humboldtiana</i>) and all have some tolerance to fire, but are susceptible to drought (except <i>S. purpurea</i>). Except for the waterlogging and/or salt tolerant species, the remainder are probably not tolerant of waterlogging or salinity. <i>S. x sepulcralis</i> is likely to be tolerant of at least 2 and susceptible to at least 2.	ML	MH
Reproduction			
9. Reproductive system	<i>S. x sepulcralis</i> ’ twigs are not fragile, mostly vegetative reproduction but seeds are also produced (Carr, 1996). Nowhere truly naturalised (Meikle, 1984). Capable of reproducing both vegetatively and by seed	H	MH
10. Number of propagules produced?	“A large crown would produce over 500 000 seeds (Cremer, 1999). Seeds numerous, very small, each with a tuft of long hairs (Tutin, 1993).	H	MH
11. Propagule longevity?	“Willow seed is very short-lived” with longer-lived species recorded at surviving 8-10 weeks (Cremer, 1999).	L	MH
12. Reproductive period?	Following reproductive maturity “flowering tends to be ample and to occur every year” (Cremer, 1999). <i>S. cinerea</i> “stands are mostly monoculture excluding 97% of sunlight and most other species” (Cremer, 1999). The oldest stem <i>S. exigua</i> in this study was 31 years (Ottenbreit & Staniforth, 1992). An old <i>S. fragilis</i> tree was observed to 130 years (Meikle, 1984).	H	MH
13. Time to reach reproductive maturity?	“Flowering and the production of viable seed may begin two to three years after germination, provided the plant is at least 1m tall if it is a shrub willow, or 2m tall if it is a tree willow...In some taxa (eg. <i>S. alba</i>) flowering tends to begin at larger sizes” (Cremer, 1999), which is probably still within 5 years.	ML	MH

Invasiveness Assessment Record

Scientific name: *Salix x sepulcralis* Simonk.*

Common Name: Willows

QUESTION	COMMENTS	RATING	CONFIDENCE
	For plants that have reproduced vegetatively, this may be reduced, as in <i>S. nigra</i> , observed flowering on cuttings produced from < 1 year old growth (Crouch & Honeyman, 1986).		
Dispersal			
14. Number of mechanisms?	Vegetative propagules and seed spread by water. "Seed is easily carried by wind" (Cremer, 1999).	H	MH
15. How far do they disperse?	In <i>S. x sepulcralis</i> , where vegetative reproduction predominates (ARMCANZ, 2001), <i>S. x rubens</i> provides evidence that "very few individuals observed long distances from existing mature trees and these were downstream of cities, towns and homesteads" (Shafroth et al, 1994).	MH	MH

*The weed risk assessment of this taxon includes *S. sepulcralis* var. *chrysocoma*.

References cited:

- Agriculture & Resource Management Council of Australia & New Zealand (ARMCANZ) 2001, *Weeds of National Significance Willow (Salix taxa, excluding S. babylonica, S. x calodendron and S. x reichardtii) Strategic Plan*, National Weeds Strategy Executive Committee, Launceston.
- Bahnzaf R, Kranzle M, Muhle H & Winkler S 1983, 'Effect of leaf leachates on nitrogen mineralization [German],' *Verhandlungen der Gesellschaft fur Okologie*, vol. 10, p. 63-70.
- Bailey LH & Bailey LZ 1976 *Hortus Third*, Macmillan, New York & London.
- Besaans (ed.) 1995, *Plant Protection News* vol. 47, pp. 20-24.
- Bokarev KS, Kefeli VI & Kapeljusnikova LM 1966, 'Chemical and physiological properties of natural inhibitors from *Salix rubra* [Russian],' *Fizio. Rast.*, Vol. 13(2), p. 274-282.
- Bowen MR & Hoad GV 1968, 'Inhibitor content of phloem and xylem sap obtained from willow (*Salix viminalis*) entering dormancy,' *Planta.*, vol 81(1), p. 64-70.
- Carcaillet C, Bergeron Y, Richard PJH, Frechette B, Gauthier S & Prairie YT 2001 'Change of fire frequency in the eastern Canadian boreal forests during the Holocene: does vegetation composition or climate trigger the fire regime?' *Journal of Ecology*, vol. 89, p. 930-946.
- Carr GW 1996, 'Salix,' in Walsh NG & Entwisle TJ (Eds.), *Flora of Victoria*, Vol. 3, Inkata Press, Melbourne.
- Carr, GW, Yogovic, JV & Robinson, KE 1992, *Environmental Weed Invasions in Victoria*, Department of Conservation and Environment, Vic.
- Cody WJ 1996, *Flora of the Yukon Territory*, NRC Research Press, Ottawa.
- Cremer KW 1995, *Willow Identification for river management in Australia*, CSIRO Division of Forestry, Orange, NSW.
- Cremer K 1999 *Willow Management for Australian Rivers* CSIRO Forestry and Forest Products, Kingston ACT.
- Cremer, K 2001 *Exterminate Wild Pussy Willows and its most invasive relative,s* CSIRO Forestry and Forest Products, Kingston ACT.
- Cremer K 2003 'Introduced willows can become invasive pests in Australia,' *Biodiversity*, Vol. 4(4), p. 17-24.
- Cremer K, Van Kraayenoord C, Parker N & Streatfield S 1995, 'Willows spreading by seed,' *Australian Journal of Soil and Water Conservation*, Vol 8 (4), p. 18-27.
- Crouch RJ & Honeyman MN 1986, 'The relative slat tolerance of willow cuttings,' *Journal of Soil Conservation*, vol 42(2), p. 103-104.
- Davis PH 1982, *Flora of Turkey and the east Aegean Islands*, Vol. 7, Edinburgh Uni Press, Edinburgh.
- Davison RM 1965, 'Some properties of a plant growth inhibitor present in xylem sap of woody species,' *Australian Journal of Biological Sciences*, vol. 18(3), p. 475-486.
- Fircks HA von, Daurin A (ed.), Junttila O (ed.), Nilsen J 1985 'Frost hardiness of fast-growing *Salix* species,' *Plant production in the north. Proceeding from 'Plant adaptation workshop*, Norway.

Invasiveness Assessment Record

Scientific name: *Salix x sepulcralis* Simonk.*

Common Name: Willows

- Gilliver K 1947, 'The effect of plant extracts on the germination of the conidia of *Venturia inaequalis*,' *Ann. Appl. Biol.*, vol. 34(1), p. 136-143.
- Griffiths M 1992, *The New Royal Horticultural Society dictionary of gardening*, vol. 4, Macmillan, London.
- Haines A 2004 *Salix myrcoides* (bayberry willow) *Conservation and Research Plan for New England*, New England Flower Society, Framingham, Massachusetts, USA.
- Henderson L 1991 'Alien invasive *Salix* spp. (willows) in the grassland biome of South Africa,' *South African Forestry Journal*, vol. 157, p. 91-95.
- Hitchcock CL & Cronquist A 1964, *Vascular Plants of the Pacific Northwest (Part 2)*, University of Washington Press, Seattle & London.
- Howard RA 1988, *Flora of the Lesser Antilles*, Vol. 4, Arnold Arboretum, Harvard Uni, Jamaica Plain, Massachusetts.
- Holm L et al 1979, *A geographical atlas of world weeds*, Wiley, New York.
- Koul VK, Raina A, Dhanna YP, Tickoo ML & Singh 1991, 'Evaluation of allelopathic influence of certain farm grown tree species on rice (*Oryza sativa* L. c.v. PC 19),' *Indian Journal of Forestr*, vol. 14(1), p. 54-57.
- Ladson A, Gerrish G, Carr G, Thexton E 1997, *Willows Along Victorian Waterways*, Waterways Unit, Department of Natural Resources and Environment, Vic, Australia.
- Maloney RF, Keedwell, RJ, Wells NJ, Reergen AL & Nilsson RG 1999, 'Effect of willow removal on habitat use by five birds of braided rivers, MrKenzie Basin, New Zealand, *New Zealand Journal of Ecology*, Vol. 23, P. 53-60.
- Meikle RD 1984, *Willows and Poplars of Great Britain and Ireland*, Botanical Society of the British Isles, London.
- Munz PA & Keck DD 1963, *A California Flora*, University of California Press, Berkley & LA.
- Newsholme C 1992, *Willows: The genus Salix*, Tumber Press, Portland & Oregon.
- Ottensbreit KA & Staniforth JR 1992, 'Life cycle and age structure of ramets in an expanding population of *Salix exigua* (sandbar willow),' *Canadian Journal of Botany*, vol. 70(6), p. 1141-1146.
- Purtle C, Stelling F, Martin D, Grossman T, Frankenberg J, Campbell S & Dwyer C 2001a *Willow Identification Guide*, Department of Land and Water Conservation, NSW.
- Purtle C, Stelling F, Martin D, Grossman T, Frankenberg J, Campbell S & Dwyer C 2001b *Willows along watercourses: an introduction*, Department of Land and Water Conservation, NSW.
- Purtle C, Stelling F, Martin D, Grossman T, Frankenberg J, Campbell S & Dwyer C 2001c Department of Land and Water Conservation, NSW.
- Shafroth PB, Scott ML & Friedman JM 1994, 'Establishment, sex structure & breeding system of an exotic riparian willow, *Salix x rubens*,' *American Midland Naturalist*, vol. 132, p. 159-172.
- Spencer R 1997, *Horticultural Flora of South-Eastern Australia*, vol. 2, UNSW Press, Australia.
- Strutek M, Bauer V, Klimes L & Pinosova J 1988, 'Ecology of economically important plants in the river Luznice floodplain,' *Sbornik Vysoka Skola Zemedelska*, Vol. 5(2), p. 105-118.
- Standley PC & Steyermark JA 1958, *Flora of Guatemala*, Vol. 24, *Chicago Natural History Museum*, USA.
- Swift CE 1997, *Colorado State University Cooperative Extension*, Colorado State University, viewed: 15/02/2006, www.colostate.edu/Depts/CoopExt/TRA/PLANTS/stable.html.
- Tutin TG 1993, *Flora Europaea*, University Press, Cambridge.
- Uchytel, RJ 1989, Fire Effects Information System, U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory, viewed: 10/01/2000, <http://www.fs.fed.us/database/feis/plants/tree/salex/atl.html>.
- Voss EG 1972, *Michigan Flora: A guide to the identification and occurrence of the native and naturalized seed plants of the state*, Crabrook Institute of Science, University of Michigan Herbarium, Michigan.
- Walters SM et al (eds) 1989, *The European Garden Flora*, Cambridge University Press, UK.

Invasiveness Assessment Record

Scientific name: *Salix x sepulcralis* Simonk.*

Common Name: Willows

Webb, Sykes & Garnock-Jones, 1988 CJ, Sykes WR, Garnock-Jones PJ 1988, *Flora of New Zealand*, vo.l. 4, Manaaki Whenua Press, NZ

Zallar S nd, *Botanical Characteristics of the Willows*, Soil Conservation Authority, Kew.

S. cinerea, *S. fragilis*, *S. x rubens* & *S. nigra* are identified by Ladson et al as outstandingly invasive because of their biology and ecology, specifically their reproductive ability.

Revisions

Date	Revised by	Revision

Present distribution of *Salix x sepulcralis* in Victoria

Scientific name: *Salix x sepulcralis* Simonk.

Common name(s): weeping willow, Kemp willow

Status:

Habitat:

Native to Europe. Found on wide variety of soils (USDA 2005). In New Zealand, mainly grows along riverbanks and lakesides where it has been planted (Webb *et al* 1988).



Potential distribution of *Salix x sepulcralis* in Victoria

Scientific name: *Salix x sepulcralis* Simonk.

Common name(s): weeping willow, Kemp willow

Status:

Habitat:

Native to Europe. Found on wide variety of soils (USDA 2005). In New Zealand, mainly grows along riverbanks and lakesides where it has been planted (Webb *et al* 1988).

Potential distribution produced from CLIMATE modelling refined by applying suitable landuse and vegetation type overlays with CMA boundaries

MAP OVERLAYS USED.

Land Use:

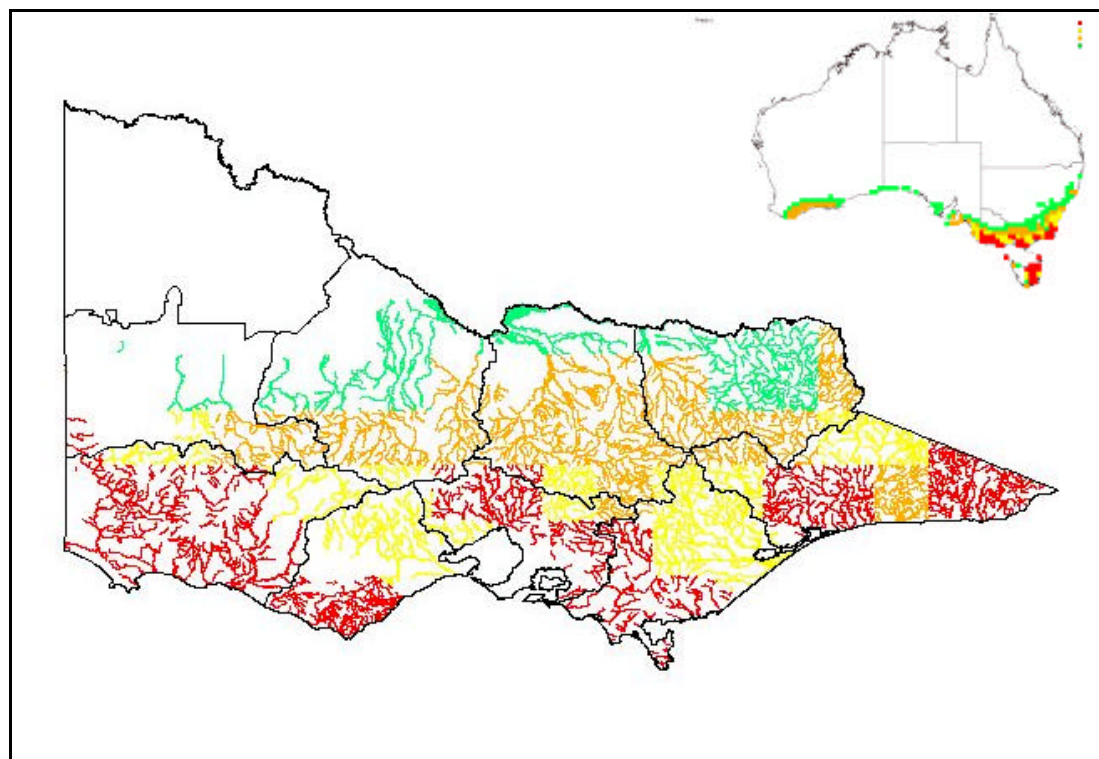
Broad vegetation types

Swamp scrub; riverine grassy woodland; riparian forest

Colours indicate possibility of *Salix x sepulcralis* infesting these areas.

Red	= Very high	Yellow	= High
Orange	= Medium	Green	= Likely

In the non-coloured areas the plant is unlikely to establish as the climate, soil or landuse is not presently suitable.



Impact Assessment Record

Scientific Name: *Salix x sepulcralis* Simonk.*

Common name: Willows

QUESTION	COMMENTS	RATING	CONFIDENCE
Social			
1. Restrict human access?	<i>S. x sepulcralis</i> tend to form single trunks (Carr, 1996), making them less likely to inhibit access by humans as they don't tend to form thickets.	L	MH
2. Reduce tourism?	<i>S. x chrysocoma</i> and <i>S. x sepulcralis</i> are <i>S. babylonica</i> (weeping willow) hybrids (with <i>S. alba</i> var. <i>vitellina</i>) and so is <i>S. x pendulina</i> (<i>S. babylonica</i> x <i>S. fragilis</i>) (Meikle, 1984). All resemble the weeping willow (Cremer, 1995), which is valued aesthetically and historically in waterways (ARMCANZ, 2001).	L	MH
3. Injurious to people?	No reference to human injury found in any reference. Toxicity rated as 'none' for the species summarised in the USDA Plants Database (2006) including <i>S. purpurea</i> , <i>S. exigua</i> , <i>S. nigra</i> , <i>S. x sepulcralis</i> , <i>S. alba</i> . Presume no toxicity for any <i>Salix</i> .	L	MH
4. Damage to cultural sites?	As semi-aquatic species, confined to stream banks or beds or moist locations (Carr, 1996; Carr et al, 1992; Cody, 1996; Davis, 1982; Howard, 1988; Ladson et al, 1997; Maloney et al, 1999; Munz, 1963; Voss, 1972; Webb, Sykes & Garnock-Jones, 1988) willows are unlikely to grow near enough to cause structural or visual damage to cultural sites. However, during floods, senescent trees can drop large branches or trunks into waterways and a build up of material behind these snags can destroy bridges (ARMCANZ, 2001). Major damage to buildings can occur when streams change route because they have become clogged with mats of willow roots. A Tasmanian Landcare group was formed in response to flooded homes, the cause of which was attributed to stream blockages by willow roots encroaching into streams (Sarah Holland-Clift pers. comm.).	H	MH
Abiotic			
5. Impact flow?	<i>S. x sepulcralis</i> tend to be confined to riverbanks (Carr, 1996), which makes them less likely to impact on flow.	L	MH
6. Impact water quality?	As deciduous plants (Carr, 1996), all shrub and tree willows have mass autumn leaf fall, which leads to decreased oxygen levels (Ladson et al, 1997). Intense shading by willows, which tend to have more dense canopies than native species decreases water temperature (Ladson et al, 1997).	H	MH
7. Increase soil erosion?	<i>S. x sepulcralis</i> tend to be confined to riverbanks (Carr, 1996), which makes them unlikely to cause erosion, indeed willows were often planted to ameliorate erosion on revegetated banks (Ladson et al, 1997).	L	MH
8. Reduce biomass?	As woody plants that can form dense thickets, or large shrubs or trees (Carr, 1996), willows are capable of increasing biomass where they replace lower or less dense vegetation as they commonly do in disturbed sites (Cremer, 1999).	L	MH
9. Change fire regime?	Willows are low flammable/combustible trees (Carcaillet et al, 2001), likely to greatly change the frequency and intensity of fire risk.	H	H

Impact Assessment Record

Scientific Name: *Salix x sepulcralis* Simonk.*

Common name: Willows

QUESTION	COMMENTS	RATING	CONFIDENCE
Community Habitat			
10. Impact on composition (a) high value EVC	Basin=East Gippsland- Cann River (ISC=Excellent); CMA=East Gippsland; CLIMATE=VH. For willow species in general, their “dense shade and mat-forming willow roots suppress and kill indigenous understorey” (Purtle et al, 2001b). Capable of displacing some dominant species	MH	MH
(b) medium value EVC	All Victorian water bodies considered to comprise high value EVCs only (Weiss pers. coms.).	L	H
(c) low value EVC	All Victorian water bodies considered to comprise high value EVCs only (Weiss pers. coms.).	L	H
11. Impact on structure?	For willow species in general, their “dense shade and mat-forming willow roots suppress and kill indigenous understorey” (Purtle et al, 2001b).	MH	MH
12. Effect on threatened flora?	No information found.	MH	L
Fauna			
13. Effect on threatened fauna?	No information found.	MH	L
14. Effect on non-threatened fauna?	Intense shading decreases primary production in waterways, impacting on invertebrates and fish (Ladson et al, 1997). Reduce indigenous vegetation which would otherwise provide habitat (especially tree hollows) and pollen and nectar food sources (Ladson, 1997) “Dense shade and mat-forming willow roots suppress and kill indigenous understorey [which is] important habitat for insects, birds and mammals. Bare banks beneath willows provide little protection for frogs, water rats, snakes, lizards and other fauna. Willows do not provide nectar for native birds...Willows also have few hollows, important habitat for over half of our woodland birds and mammals” (Purtle et al, 2001b). Reduction in habitat for fauna, leading to reduction in numbers of individuals but not to local extinction.	MH	MH
15. Benefits fauna?	The palatability of this species is unknown and, as <i>S. x sepulcralis</i> tend to form single trunks (Carr, 1996), they are unlikely to provide habitat for fauna as they don’t tend to form thickets.	M	L
16. Injurious to fauna?	No reference to animal injury found in any reference.	L	H
Pest Animal			
17. Food source to pests?	The palatability of other species is unknown.	M	L

Impact Assessment Record

Scientific Name: *Salix x sepulcralis* Simonk.*

Common name: Willows

QUESTION	COMMENTS	RATING	CONFIDENCE
18. Provides harbor?	As <i>S. x sepulcralis</i> tend to form single trunks (Carr, 1996), they are unlikely to provide harbour for pest species as they don't tend to form thickets.	L	MH
Agriculture			
19. Impact yield?	Generally willows are valued for shade and browsing for livestock (Besaans, 1995).	L	MH
20. Impact quality?	Generally willows are valued for shade and browsing for livestock (Besaans, 1995).	L	MH
21. Affect land value?	"Fibrous willow roots and dense willow foliage trap large amounts of silt which can decrease channel capacity, exacerbate flooding and change flood patterns...Willows encroaching into the centre of streams interrupt the flow of water which results in stream flows being directed into watercourse banks, causing erosion." (Purtle, 2001b). Whilst risk of floods and erosion may cause decrease in land value in some incidences, with a state wide view, this is likely to be negligible.	L	MH
22. Change land use?	Willows are associated with waterways and not recorded as invaders of pasture or crops in the extensive literature. Whilst control may be required (see Q. 23) there is little risk that land use would need to change as a consequence of their invasion of agricultural land.	L	H
23. Increase harvest costs?	<i>S. x sepulcralis</i> tend to be confined to riverbanks (Carr, 1996), which makes them unlikely to have a negative impact on agriculture.	L	MH
24. Disease host/vector?	Not found in the extensive literature.	L	H

* The weed risk assessment of this taxon includes *S. sepulcralis* var. *chrysocoma*.

References cited:

Agriculture & Resource Management Council of Australia & New Zealand (ARMCANZ) 2001, *Weeds of National Significance Willow (Salix taxa, excluding S. babylonica, S. x calodendron and S. x reichardtii) Strategic Plan*, National Weeds Strategy Executive Committee, Launceston.

Aiken SG, Dallwitz MJ, Consaul LL, McJannet CL, Gillespie LJ, Boles RL, Argus GW, Gillett JM, Scott PJ, Elven R, LeBlanc MC, Brysting AK & Solstad H 1999, *Flora of the Canadian Arctic Archipelago: Descriptions, Illustration, Identification, and Information Retrieval*, Memorial University of Newfoundland, viewed: 16/02/2006, www.mun.ca/biology/delta/arctic/_ca/ www.wl.htm.

Bailey LH & Bailey LZ 1976 *Hortus Third*, Macmillan, New York & London.

Besaans (ed.) 1995, *Plant Protection News* vol. 47, pp. 20-24.

Carcaillet C, Bergeron Y, Richard PJH, Frechette B, Gauthier S & Prairie YT 2001 'Change of fire frequency in the eastern Canadian boreal forests during the Holocene: does vegetation composition or climate trigger the fire regime?' *Journal of Ecology*, vol. 89, p. 930-946.

Carr GW 1996, 'Salix,' in Walsh NG & Entwisle TJ (Eds.), *Flora of Victoria*, Vol. 3, Inkata Press, Melbourne.

Carr, GW, Yogovic, JV & Robinson, KE 1992, *Environmental Weed Invasions in Victoria*, Department of Conservation and Environment, Vic.

Cody WJ 1996, *Flora of the Yukon Territory*, NRC Research Press, Ottawa.

Cremer KW 1995, *Willow Identification for river management in Australia*, CSIRO Division of Forestry, Orange, NSW.

Impact Assessment Record

Scientific Name: *Salix x sepulcralis* Simonk.*

Common name: Willows

- Cremer K 1999 *Willow Management for Australian Rivers* CSIRO Forestry and Forest Products, Kingston ACT.
- Cremer, K 2001 *Exterminate Wild Pussy Willows and its most invasive relative,s* CSIRO Forestry and Forest Products, Kingston ACT.
- Crouch RJ & Honeyman MN 1986, 'The relative salt tolerance of willow cuttings,' *Journal of Soil Conservation*, vol 42(2), p. 103-104.
- Davis PH 1982, *Flora of Turkey and the east Aegean Islands, Vol. 7*, Edinburgh Uni Press, Edinburgh.
- Fircks HA von, Daurin A (ed.), Junttila O (ed.), Nilsen J 1985 'Frost hardiness of fast-growing *Salix* species,' *Plant production in the north. Proceeding from 'Plant adaptation workshop*,' Norway.
- Haines A 2004 *Salix myrcoides (bayberry willow) Conservation and Research Plan for New England*, New England Flower Society, Framingham, Massachusetts, USA.
- Henderson L 1991 'Alien invasive *Salix* spp. (willows) in the grassland biome of South Africa,' *South African Forestry Journal*, vol. 157, p. 91-95.
- Hitchcock CL & Cronquist A 1964, *Vascular Plants of the Pacific Northwest (Part 2)*, University of Washington Press, Seattle & London.
- Howard RA 1988, *Flora of the Lesser Antilles*, Vol. 4, Arnold Arboretum, Harvard Uni, Jamaica Plain, Massachusetts.
- Holm L et al 1979, *A geographical atlas of world weeds*, Wiley, New York.
- Kennedy SA, Ganf FF & Walker KF 2003, 'Does salinity influence the distribution of exotic willows (*Salix* spp.) along the Lower River Murray?' *Marine and Freshwater Research*, vol 54, p. 825-831.
- Ladson A, Gerrish G, Carr G, Thexton E 1997, *Willows Along Victorian Waterways*, Waterways Unit, Department of Natural Resources and Environment, Vic, Australia.
- Maloney RF, Keedwell, RJ, Wells NJ, Reergen AL & Nilsson RG 1999, 'Effect of willow removal on habitat use by five birds of braided rivers, MrKenzie Basin, New Zealand, *New Zealand Journal of Ecology*, Vol. 23, P. 53-60.
- Meikle RD 1984, *Willows and Poplars of Great Britain and Ireland*, Botanical Society of the British Isles, London.
- Munz PA & Keck DD 1963, *A California Flora*, University of California Press, Berkley & LA.
- Muyt A 2001, *Bush invaders of South-East Australia*, RG and FJ Richardson, Meredith, Vic.
- Newsholme C 1992, *Willows: The genus Salix*, Tumber Press, Portland & Oregon.
- Purtle C, Stelling F, Martin D, Grossman T, Frankenberg J, Campbell S & Dwyer C 2001a *Willow Identification Guide*, Department of Land and Water Conservation,
- Purtle C, Stelling F, Martin D, Grossman T, Frankenberg J, Campbell S & Dwyer C 2001b *Willows along watercourses: an introduction*, Department of Land and Water Conservation,
- Purtle C, Stelling F, Martin D, Grossman T, Frankenberg J, Campbell S & Dwyer C 2001c Department of Land and Water Conservation,
- Shafroth PB, Scott ML & Friedman JM 1994, 'Establishment, sex structure & breeding system of an exotic riparian willow, *Salix x rubens*,' *American Midland Naturalist*, vol. 132, p. 159-172.
- Srutek M, Bauer V, Klimes L & Pinosova J 1988, 'Ecology of economically important plants in the river Luznice floodplain,' *Sbornik Vysoka Skola Zemedelska*, Vol. 5(2), p. 105-118.
- Standley PC & Steyermark JA 1958, *Flora of Guatemala, Vol. 24*, Chicago Natural History Museum, USA.
- Swift CE 1997, *Colorado State University Cooperative Extension*, Colorado State University, viewed: 15/02/2006, www.colostate.edu/Depts/CoopExt/TRA/PLANTS/stable.html.
- Uchytel, RJ 1989, Fire Effects Information System, U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory, viewed: 16/02/2006, www.fs.fed.us/database/feis/plants/tree/salnig/all.html.
- United States Department of Agriculture (USDA) 2006 USDA Plants Database, Washington, viewed: 16/02/2006, http://plants.nrcs.usda.gov/cgi_bin/topics.cgi?earl=characteristics.html.

Impact Assessment Record

Scientific Name: *Salix x sepulcralis* Simonk.*

Common name: Willows

Voss EG 1972, *Michigan Flora: A guide to the identification and occurrence of the native and naturalized seed plants of the state*, Crabbrook Institute of Science, University of Michigan Herbarium, Michigan.

Walters SM et al (eds) 1989, *The European Garden Flora*, Cambridge University Press, UK.

Webb CJ, Sykes WR, Garnock-Jones PJ 1988, *Flora of New Zealand*, vo.l. 4, Manaaki Whenua Press, NZ

Zallar S nd, *Botanical Characteristics of the Willows*, Soil Conservation Authority, Kew.

Revisions

Date	Revised by	Revision

Invasiveness Assessment Record

Scientific name: *Scolymus maculatus* L.

Common Name: Spotted thistle

QUESTION	COMMENTS	RATING	CONFIDENCE
Establishment			
1. Germination requirements?	Germinate in autumn or early winter (Parsons & Cuthbertson, 1992). Natural seasonal disturbance required.	MH	MH
2. Establishment requirements?	“Can grow in semi-shade (light woodland) or no shade (PFAF, 2000). Can establish without access to direct light.	H	M
3. How much disturbance is required?	“Weed of disturbed sites, mainly in arable fields and waste places” (Parsons & Cuthbertson, 1992). “Uncultivated land, in abandoned fields and ditches and along paths and waysides” (Neuz & Bermejo, 1994). Waysides and cornfields (PFAF, 2000). Establishes in highly disturbed sites.	ML	H
Growth/Competitive			
4. Life form?	Annual herb to 50-100cm (Parsons & Cuthbertson, 1992).	L	MH
5. Allelopathic properties?	None found recorded.	L	L
6. Tolerates herb pressure?	“Aerial growth is not eaten because of the spines...even sparse stands are avoided by stock” (Parsons & Cuthbertson, 1992). “Nothing will either eat it or approach it” (Maiden, 1908).	H	H
7. Normal growth rate?	Young plants produce a “slowly developing rosette” from autumn or early winter and then “much branched stems form in late winter” (Parsons & Cuthbertson, 1992). “With hot temperatures the plant grows very rapidly, with the basal rosette forming quickly” (Neuz & Bermejo, 1994). Annual herb to 50-100cm (Parsons & Cuthbertson, 1992). This herb reaches an average height for an annual.	MH	MH
8. Stress tolerance to frost, drought, w/logg, sal. etc?	“Tolerates cold and drought” (Neuz & Bermejo, 1994). Danin (2005) records this plant growing in winter water-logged soils. Hardy to zone 7 (PFAF) –16°C - 12°C. Halophytic [salt-tolerant] (UNEP-WCMC, 2005). Highly tolerant to frost, and some tolerance to drought, salinity and seasonal water-logging	M	M
Reproduction			
9. Reproductive system	Seed (Parsons & Cuthbertson, 1992). Hermaphrodite flowers (PFAF, 2000). No further information was found but there is the potential for cross- and self-fertilisation with hermaphrodite flowers.	ML	M
10. Number of propagules produced?	“Capitula...solitary or in clusters of two to four” (Neuz & Bermejo, 1994). Picture of mature plant shows at least 55 capitula (Parsons & Cuthbertson, 2002), and a photograph (Wikipedia, 2006) shows a capitulum with at least 20 florets. 55 x 20 = 1100 propagules.	MH	ML
11. Propagule longevity?	“Germination capacity is maintained for a long time” (Neuz & Bermejo, 1994).	M	H
12. Reproductive period?	Annual herb (Parsons & Cuthbertson, 1992).	L	MH
13. Time to reproductive maturity?	“Seeds germinate in autumn or early winter...aerial growth dies in late summer after seeds have matured” (Parsons & Cuthbertson, 1992). Less than a year.	H	MH

Invasiveness Assessment Record

Scientific name: *Scolymus maculatus* L.

Common Name: Spotted thistle

QUESTION	COMMENTS	RATING	CONFIDENCE
Dispersal			
14. Number of mechanisms?	Whole plants transported by wind and water and “spiny seed head catches in wool” and the plant is “present along the stock route from Breeza through Warrah to Merriwa” (Parsons & Cuthbertson, 1992), indicating transport by animals (externally).	MH	MH
15. How far do they disperse?	“Aerial growth dies...after seeds have matured and, breaking off at the base, blows away much like a tumbleweed, shedding seeds as it goes...some plants, blown into creeks or rivers, float for long distances...Present along the stock route from Breeza through Warrah to Merriwa”... Seed are “not well adapted to wind dispersal...quite bouyant” Spiny seed heads catch in wool and contaminate fodder (Parsons & Cuthbertson, 1992). Transport by floating and attached to animals makes it likely that some propagules will disperse greater than 1km.	H	MH

References cited:

Danin, A, 2005, *The Jerusalem Botanical Gardens*, viewed: 19/12/2005, <http://www.botanic.co.il/a/articles/WebsiteVegIsr.htm>.

Maiden, JH “Another Bad Weed for New South Wales,’ *Agricultural Gazette of N.S.W.*, vol. 19, p. 1029-1030.

Neuz, F and Bermejo, JEH 1994, *Neglected horticultural crops* Plant Production and Protection Series, No. 26, p. 303-332.

Parsons, WT & Cuthbertson, EG 1992, *Noxious Weeds of Australia* (2nd ed.) CSIRO Publishing, Australia.

Plants for a future (PFAF) 2000, viewed: 12/12/2005, http://ibiblio.org/pfaf/cgi-bin/arr_html?Scolymus+maculatus

UNEP-WCMC 2005, *United Nations Environment Programme World Conservation Monitoring Centre*, Cambridge, UK, viewed: 12/12/2005, <http://www.unep-wcmc.org/index.html?http://sea.unep-wcmc.org/sites/wh/ichkeul.html~main>

Wikipedia contributors 2006, *Wikipedia*, Wikimedia foundation, Florida, USA, viewed: 02/02/2006, http://en.wikipedia.org/wiki/Golden_Thistle.

Revisions

Date Revised by Revision

Present distribution of *Scolymus maculatus* in Victoria

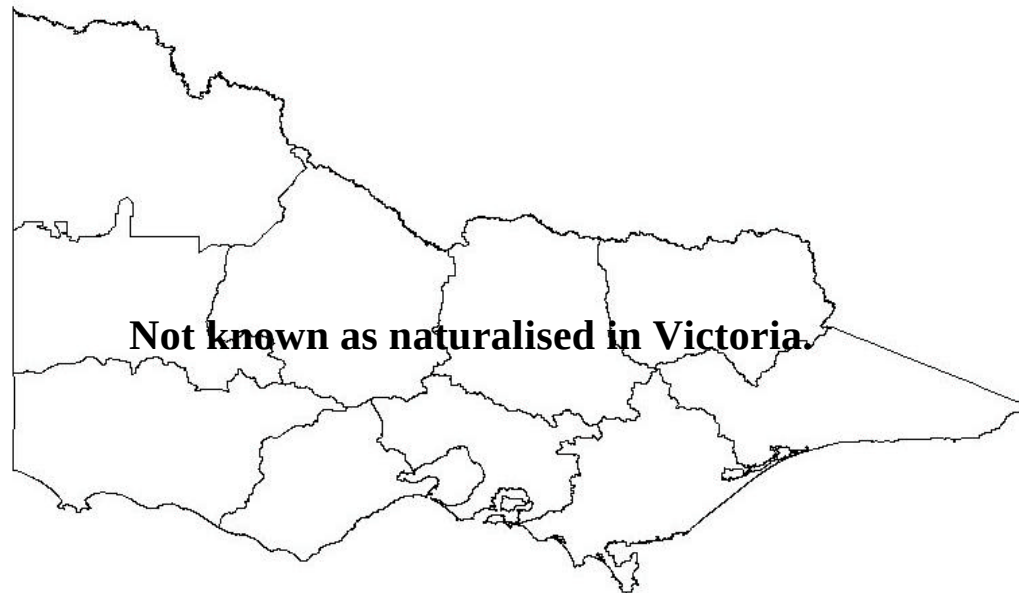
Scientific name: *Scolymus maculatus* L.

Common name(s): spotted thistle, spotted golden thistle

Status:

Habitat:

Subhumid warm-temperate regions having a winter dominant rainfall. Thriving on heavier soils, occurs as a weed of disturbed sites, mainly in arable fields and waste places (Parsons & Cuthbertson 2001). Native to Mediterranean region. Found on uncultivated land, in abandoned fields and ditches along paths and waysides. Prefers clay soils and temperate climates (Nuez & Hernandez Bermejo 1994).



Potential distribution of *Scolymus maculatus* in Victoria

Scientific name: *Scolymus maculatus* L.

Common name(s): spotted thistle, spotted golden thistle

Status:

Habitat:

Subhumid warm-temperate regions having a winter dominant rainfall. Thriving on heavier soils, occurs as a weed of disturbed sites, mainly in arable fields and waste places (Parsons & Cuthbertson 2001). Native to Mediterranean region. Found on uncultivated land, in abandoned fields and ditches along paths and waysides. Prefers clay soils and temperate climates (Nuez & Hernandez Bermejo 1994).

Potential distribution produced from CLIMATE modelling refined by applying suitable landuse and vegetation type overlays with CMA boundaries

MAP OVERLAYS USED.

Land Use:

Broadacre cropping
Pasture dryland / irrigation

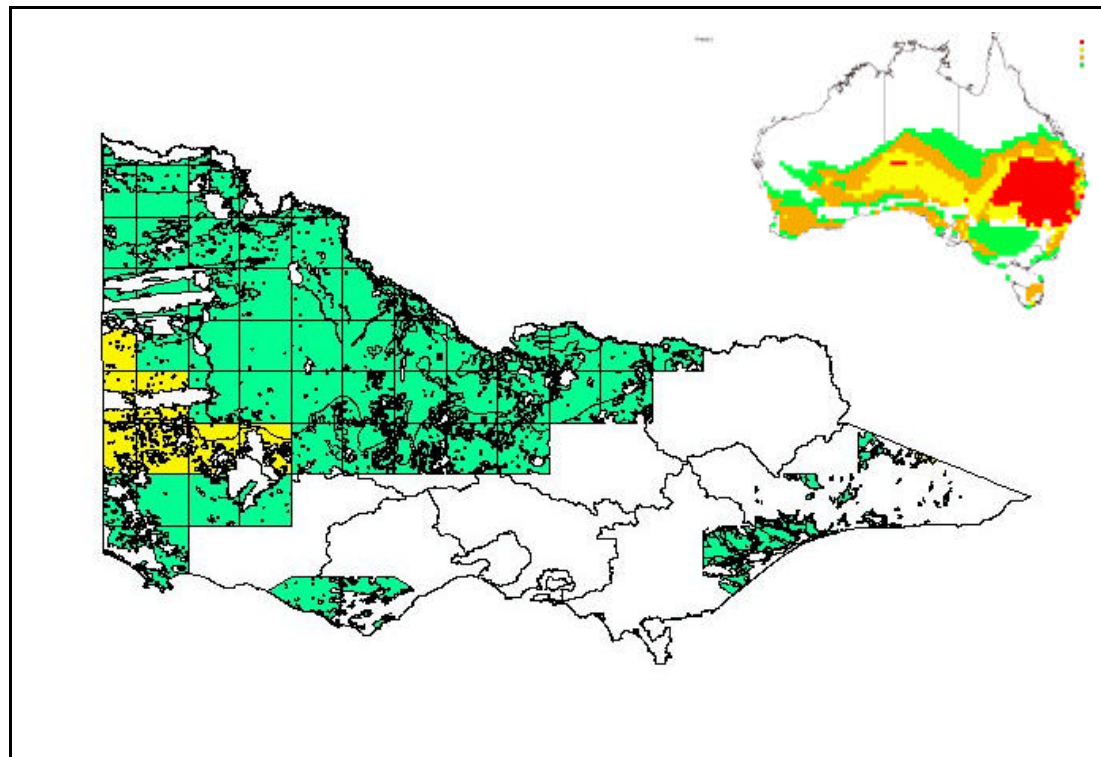
Broad vegetation types

Swamp scrub; box ironbark forest; grassland; plains grassy woodland; valley grassy forest; rainshadow woodland; mallee; mallee woodland; Wimmera / mallee woodland

Colours indicate possibility of *Scolymus maculatus* infesting these areas.

Red	= Very high	Yellow	= High
Orange	= Medium	Green	= Likely

In the non-coloured areas the plant is unlikely to establish as the climate, soil or landuse is not presently suitable.



Impact Assessment Record

Scientific Name: *Scolymus maculatus* L.

Common name: spotted thistle

QUESTION	COMMENTS	RATING	CONFIDENCE
Social			
1. Restrict human access?	“Because of its spininess, dense patches of this weed become impenetrable to stock.” As an annual herb with many branches to 50-100cm (Parsons & Cuthbertson, 1992), dense patches of this plant may impede individual access at certain times of the year.	ML	MH
2. Reduce tourism?	The tendency for this spiny shrub to invade disturbed sites (Parsons & Cuthbertson, 1992), including along pathways (Neuz & Bermejo, 1994) would make it obvious to the average visitor, but probably wouldn’t prevent recreational use of the area.	ML	MH
3. Injurious to people?	Minor injury may occur from late winter to late summer, when the spiny branches of this plant are present (Parsons & Cuthbertson, 1992).	ML	MH
4. Damage to cultural sites?	As an annual herb with many branches to 50-100cm and yellow flowers (Parsons & Cuthbertson, 1992), dense patches of this plant may have a moderate visual effect at certain times of the year.	ML	MH
Abiotic			
5. Impact flow?	Terrestrial species (Parsons & Cuthbertson, 1992).	L	MH
6. Impact water quality?	Terrestrial species (Parsons & Cuthbertson, 1992).	L	MH
7. Increase soil erosion?	This plant has relatively sparse aerial growth that does not appear to shade out ground flora beneath its canopy (see picture in Parsons & Cuthbertson, 1992) so it is unlikely to leave bare patches of soil in summer when it dies off, having little or no impact on erosion.	L	MH
8. Reduce biomass?	This plant has relatively sparse aerial growth that does not appear to shade out ground flora beneath its canopy (see picture in Parsons & Cuthbertson, 1992) so it is unlikely to have any net impact on biomass as a carbon sink.	ML	MH
9. Change fire regime?	This annual plant has relatively sparse aerial growth that does not appear to shade out ground flora beneath its canopy (see picture in Parsons & Cuthbertson, 1992). However, since “nothing will either eat it or approach it” (Maiden, 1908), this plant may allow grassy fuel loads to increase in the absence of grazing, increasing the likelihood of fire.	ML	H
Community Habitat			
10. Impact on composition (a) high value EVC	EVC=Plains Grassy Woodland (E), CMA=Wimmera, Bioreg.=Wimmera, CLIMATE=M. This plant has relatively sparse aerial growth that does not appear to shade out ground flora beneath its canopy (see picture in Parsons & Cuthbertson, 1992), but its rapid growth may compete with low shrub and ground layer vegetation for space, water and nutrients. Sparse infestations.	L	MH
(b) medium value EVC	EVC=Box Ironbark Forest (D), CMA=Wimmera, Bioreg.=Goldfields, CLIMATE=M. This plant has relatively sparse aerial growth that does not appear to shade out ground flora beneath its canopy (see picture in Parsons & Cuthbertson, 1992), but its rapid growth may compete with low shrub and ground layer vegetation for space, water and nutrients. Sparse infestations.	L	MH

Impact Assessment Record

Scientific Name: *Scolymus maculatus* L.

Common name: spotted thistle

QUESTION	COMMENTS	RATING	CONFIDENCE
(c) low value EVC	EVC=Lowland forest (LC), CMA=Wimmera, Bioreg.=Wimmera, CLIMATE=M. This plant has relatively sparse aerial growth that does not appear to shade out ground flora beneath its canopy (see picture in Parsons & Cuthbertson, 1992), but its rapid growth may compete with low shrub and ground layer vegetation for space, water and nutrients. Sparse infestations.	L	MH
11. Impact on structure?	This plant has relatively sparse aerial growth that does not appear to shade out ground flora beneath its canopy (see picture in Parsons & Cuthbertson, 1992).	L	MH
12. Effect on threatened flora?	No information found.	MH	L
Fauna			
13. Effect on threatened fauna?	No information found.	MH	L
14. Effect on non-threatened fauna?	"Dense patches...reduce available grazing...Even sparse stands are avoided by stock...because of the spines...further reducing the grazing area" (Parsons & Cuthbertson, 1992). "Nothing will either eat it or approach it" (Maiden, 1908). This plant may reduce the food available to grazing fauna, reducing numbers of individuals, but not causing local extinctions.	MH	MH
15. Benefits fauna?	"Harbour vermin" (Parsons & Cuthbertson, 1992) and so may provide habitat for small native fauna also.	MH	MH
16. Injurious to fauna?	From late winter to late summer the spiny branches of this plant are present (Parsons & Cuthbertson, 1992) which may injure fauna at some times of the year.	MH	MH
Pest Animal			
17. Food source to pests?	"Nothing will either eat it or approach it" (Maiden, 1908). Unlikely to be a food source to pests.	L	H
18. Provides harbor?	"Harbour vermin" (Parsons & Cuthbertson, 1992).	MH	MH
Agriculture			
19. Impact yield?	"Dense patches...reduce available grazing...Even sparse stands are avoided by stock...because of the spines...further reducing the grazing area" (Parsons & Cuthbertson, 1992). Also grows in cornfields (PFAF, 2000) and its rapid growth may compete with crops for space, water and nutrients.	MH	MH

Impact Assessment Record

Scientific Name: *Scolymus maculatus* L.

Common name: spotted thistle

QUESTION	COMMENTS	RATING	CONFIDENCE
20. Impact quality?	"Spiny seed head catches in wool or contaminates fodder" (Parsons & Cuthbertson, 1992).	ML	MH
21. Affect land value?	Can be controlled by persistent and thorough cultivation through successive seed germinations or with common herbicides (Parsons & Cuthbertson, 1992). Unlikely to impact land value.	L	MH
22. Change land use?	The ability to control this annual weed using conventional methods (Parsons & Cuthbertson, 1992) means that land use should not have to change much, if at all.	L	MH
23. Increase harvest costs?	The ability to control this annual weed using conventional methods (Parsons & Cuthbertson, 1992) will cause a minor increase to the cost of harvest.	MH	MH
24. Disease host/vector?	No record of this weed as an alternative host or vector for agricultural diseases in Parsons & Cuthbertson (1992).	L	MH

References cited:

Neuz, F and Bermejo, JEH 1994, *Neglected horticultural crops* Plant Production and Protection Series, No. 26, p. 303-332.

Maiden, JH "Another Bad Weed for New South Wales," *Agricultural Gazette of N.S.W.*, vol. 19, p. 1029-1030.

Parsons WT & Cuthbertson EG, 1992 *Noxious Weeds of Australia* (2nd ed.) CSIRO Publishing, Australia.

Plants for a future (PFAF) 2000, viewed: 12/12/2005, http://ibiblio.org/pfaf/cgi-bin/arr_html?Scolymus+maculatus

Revisions

Date Revised by Revision

Invasiveness Assessment Record

Scientific name: *Senecio glastifolius* L. f.

Common Name: Holly-leaved senecio

QUESTION	COMMENTS	RATING	CONFIDENCE
Establishment			
1. Germination requirements?	Sow seeds from mid-summer to autumn (van der Walt, 2002). Pulses of germination...when temperature above 25°C...relatively high temps required (Williams et al. 1999). Germinates in wetter conditions from early autumn through winter (CRC Weed Management, 2003). Fire also seems to stimulate germination (see Brown and Brooks, 2002) but is not necessary for germination. Requires natural seasonal rainfall/temperatures.	MH	MH
2. Establishment requirements?	Establishes in full sun to light shade, either winter or all-year-round rainfall (Williams et al., 1999) in Eucalyptus woodlands and <i>Allocasuarina</i> open woodlands (Brown & Brooks, 2002). This suggests that <i>S. glastifolius</i> can establish under moderate canopy cover	MH	MH
3. How much disturbance is required?	Invades coastal areas (Dept. cons., 2002), motorways and hillsides, river mouth, dunes, wasteland, sparingly on the coast, embankment, spreading very aggressively into <i>Banksia</i> woodland and coastal shrubland on deep sands, occurs naturally in pastoral areas, is abundant on old burn sites, a troublesome weed in newly planted plantations and a general ruderal [poor land or waste] and agricultural weed, strongly associated with sparsely vegetated sites, partially stabilised sand dunes, recently felled pine plantation. Often seen after fires and in disturbed areas where it is one of the first pioneers to germinate (Williams et al., 1999). The aggressive spread into <i>Banksia</i> woodland indicates that it has the potential to invade relatively intact natural ecosystems.	MH	H
Growth/Competitive			
4. Life form?	Asteraceae herb (Dept. cons., 2002). Perennial herb (sometimes annual) (Williams et al., 1999).	L	H
5. Allelopathic properties?	None recorded	L	L
6. Tolerates herb pressure?	In NZ leaves are eaten by the larvae of the native magpie moth. Appears to be palatable to sheep. Williams et al state that “vegetative response to damage is...not a significant method of ... persistence” and that a few plants were sprouting new shoots after the top parts had died off (Williams et al., 1999). Not enough evidence was found to support either herbivory suppressing reproduction (ML) or the ability to seed under moderate herbivory pressure (MH), so a medium rating was chosen between the two.	M	H
7. Normal growth rate?	Displacing low-growing herbs and ferns and preventing establishment of native seedlings (Dept. cons., 2002). Stems 1-1.5m tall and occasionally up to 2m tall. Plants can be 0.5m wide (Williams et al., 1999).Has the ability to dominate understorey vegetation in open damp areas (CRC Weed Management, 2003). All evidence points to the potential for this species to exceed the growth of most forbs.	H	MH
8. Stress tolerance to frost, drought, w/logg, sal. etc?	Prefers wetter areas...often seen after fires (van der Walt, 2002). This is most likely from fire-stimulated germination of seeds, as documented in Brown and Brooks (2002): “fire followed by good rains led to prolific germination.” Terrestrial dry and terrestrial wet substrates and...on nutrient-poor deep sandy soils , some tolerance of high soil moisture, unlikely to tolerate	L	H

Invasiveness Assessment Record

Scientific name: *Senecio glastifolius* L. f.

Common Name: Holly-leaved senecio

QUESTION	COMMENTS	RATING	CONFIDENCE
	permanently saturated soils. Some capacity to tolerate salt as indicated by its...proximity to sea water at Motueka and Whitiau. In drought conditions it may not grow at all over summer (Williams et al., 1999). Some tolerance to salt, probably susceptible to permanent waterlogging and drought.		
Reproduction			
9. Reproductive system	Seed or cuttings (van der Walt, 2002). The main method of reproduction is sexual but can be grown from cuttings in ornamental horticulture. May occasionally form roots where stems lie horizontally, but vegetative reproduction not a significant method of spread or persistence (Williams et al, 1999). Potential may exist for self and cross pollination.	ML	H
10. Number of propagules produced?	2–3 to several hundred flower heads x 12-22 ray florets (Williams et al., 1999) (so presume more than 12-22 disk florets) = >6600 propagules	H	H
11. Propagule longevity?	“Some evidence for a persistent soil seed bank” (Williams et al., 1999). But no specific information found.	M	L
12. Reproductive period?	Not very long-lived perennial (van der Walt, 2002). No evidence for plants older than 4 years (Williams et al., 1999).	MH	H
13. Time to reproductive maturity?	Cultivation of <i>S. glastifolius</i> suggests that if plants germinate early enough and develop a bushy habit before spring, they will flower in the same year that they germinate. If they are too small, they will delay flowering until the following year (van der Walt, 2002).	H	ML
Dispersal			
14. Number of mechanisms?	Seed spread by wind and dumped in garden waste (Blood, 2001).	MH	MH
15. How far do they disperse?	Seed spread by wind and dumped in garden waste (Blood, 2001). Seed has a pappus 7-9mm long and “fluffy” (Williams et al, 1999). Presume that the pappus would likely carry it at least 20m but few would reach 1km.	ML	MH

References cited:

- Blood, K 2001 Environmental Weeds: A Field Guide for SE Australia, CH Jerram & Associates-Science Publishers, Mt Waverley, Victoria, Australia.
- Brown K & Brooks K 2002, *Bushland Weeds* Environmental Weeds Action Network, Australia.
- CRC Weed Management 2003, *Weed Management Guide: Holly leaved senecio* – *Senecio glastifolius*, Australia.
- Dept. cons. (Department of Conservation) *Have you seen these plants on Matiu/Somes Island?* (2002) NZ
- Starr, F, Starr, K, Loope, L 2003, *Hawaiian Ecosystems at Risk project (HEAR)*, US Geological Survey, viewed: 11/07/2005, www.hear.org/starr/hiplants/reports/html/thunbergia_laurifolia.htm.
- van Der Walt, L 2002, *PlantZAfrica.com*, South African National Biodiversity Institute, viewed: 21/11/2005, www.plantzafrica.com/plantqrs/senecioglast.htm.

Invasiveness Assessment Record

Scientific name: *Senecio glastifolius* L. f.

Common Name: Holly-leaved senecio

Williams, PA, Ogle, CC, Timmins, SM, La Cock, F & Reid, V 1999, 'Biology and ecology of *Senecio glastifolius* and its spread and impacts in New Zealand' *Science for Conservation* vol. 112, Deparment of Conservation, New Zealand.

Revisions		
Date	Revised by	Revision

Present distribution of *Senecio glastifolius* in Victoria

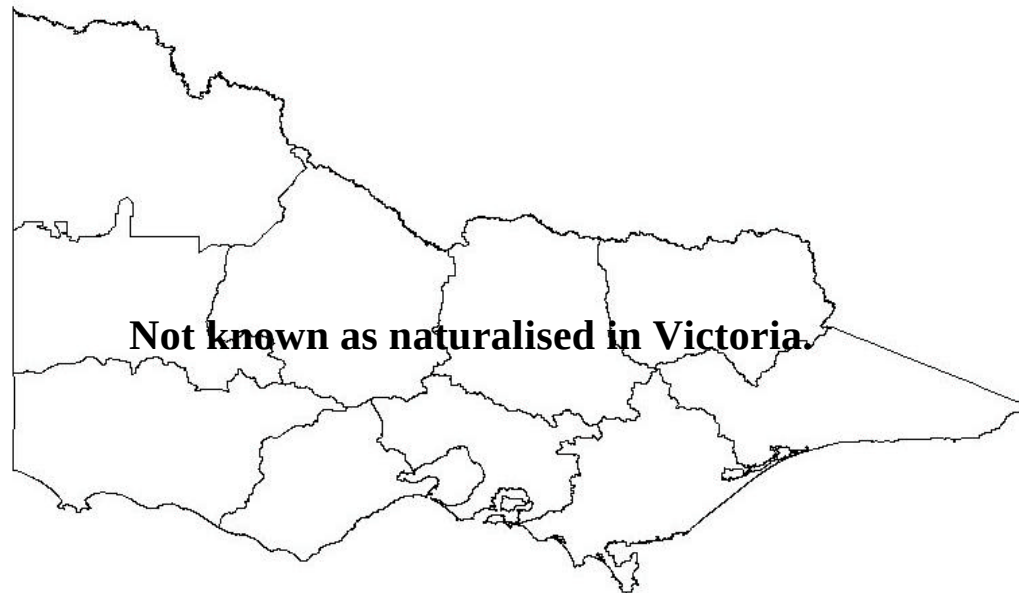
Scientific name: *Senecio glastifolius* L. f.

Common name(s): holly-leaved senecio

Status:

Habitat:

Native to South Africa. Grows in disturbed sites and agricultural lands. Occurs naturally in shrubland and near waterways. More often found in open, wet areas in its native range. In New Zealand, frequently grows on hillsides, coastal dunes and disturbed areas such as roadsides. In Australia, occurs through jarrah (*Eucalyptus marginata*), blackbutt (*Eucalyptus piularis*) and marri (*Corymbia haematoxylon*) woodlands, and in *Allocasuarina* open woodlands within Albany, Western Australia (CRC for Australian Weed Management 2003).



Potential distribution of *Senecio glastifolius* in Victoria

Scientific name: *Senecio glastifolius* L. f.

Common name(s): holly-leaved senecio

Status:

Habitat:

Native to South Africa. Grows in disturbed sites and agricultural lands. Occurs naturally in shrubland and near waterways. More often found in open, wet areas in its native range. In New Zealand, frequently grows on hillsides, coastal dunes and disturbed areas such as roadsides. In Australia, occurs through jarrah (*Eucalyptus marginata*), blackbutt (*Eucalyptus piularis*) and marri (*Corymbia haematoxylon*) woodlands, and in *Allocasuarina* open woodlands within Albany, Western Australia (CRC for Australian Weed Management 2003).

Potential distribution produced from CLIMATE modelling refined by applying suitable landuse and vegetation type overlays with CMA boundaries

MAP OVERLAYS USED.

Land Use:

Pasture dryland
Pasture irrigation

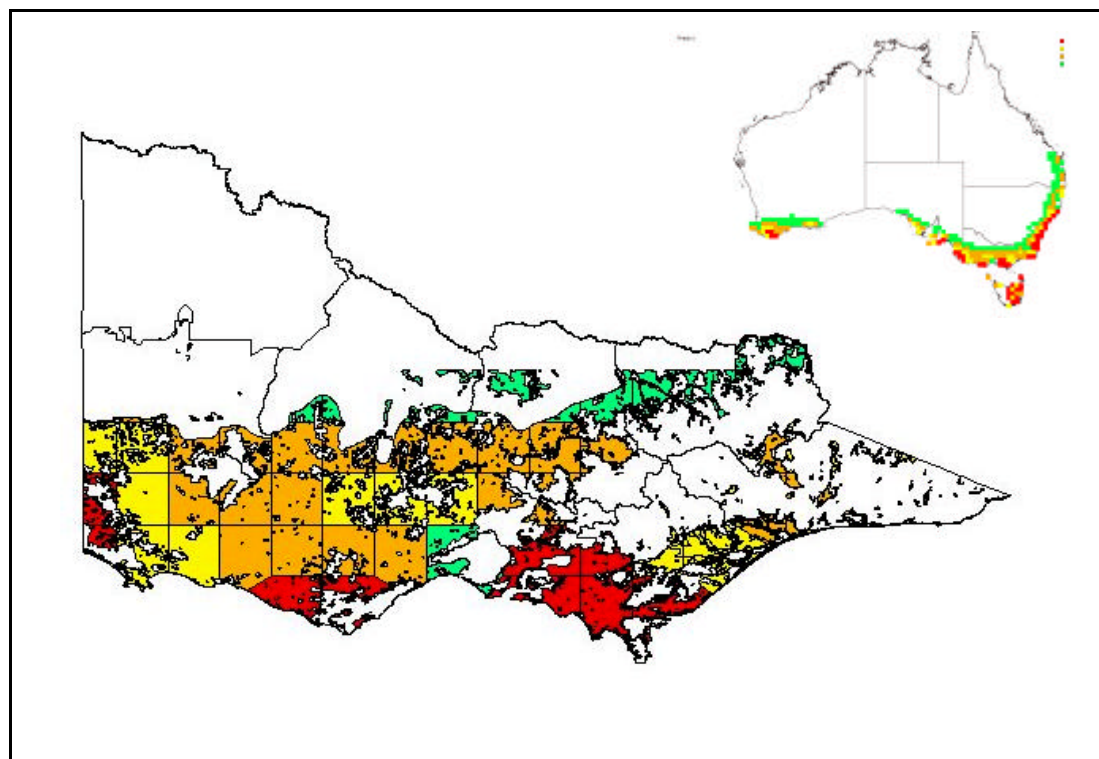
Broad vegetation types

Coastal scrubs and grassland; coastal grassy woodland; heath;
swamp scrub; riverine grassy woodland

Colours indicate possibility of *Senecio glastifolius* infesting these areas.

Red	= Very high	Yellow	= High
Orange	= Medium	Green	= Likely

In the non-coloured areas the plant is unlikely to establish as the climate, soil or landuse is not presently suitable.



Impact Assessment Record

Scientific Name: *Senecio glastifolius* L. f.

Common name: holly leaved senecio

QUESTION	COMMENTS	RATING	CONFIDENCE
Social			
1. Restrict human access?	As a short-lived herbaceous perennial (Williams et al, 1999) it is not likely to prevent human access to any destination.	L	H
2. Reduce tourism?	1-1.5m tall, occasionally up to 2m, to 0.5m wide, pink to mauve to nearly white daisy flowers. "Most conspicuous to the casual observer where it grows on road cuttings and banks...The most obvious impact ...is aesthetic-it is a spectacular plant" (Williams et al, 1999). Although it is not "native-looking," the plant is cultivated in gardens for its "cheerful flowers" (van der Walt, 2002) which wouldn't bother most people.	ML	H
3. Injurious to people?	"Hand pulling...required thick gloves and trousers" (Brown & Brooks, 2002). "The edges of the...leaves are coarsely toothed and can be quite prickly" (van der Walt, 2002). The toothed edges of the leaves may cause some discomfort if grasped, but unlikely to cause injury to most people.	ML	MH
4. Damage to cultural sites?	At 1-2m tall and with pink to mauve to nearly white daisy flowers (Williams et al, 1999) this plant may have a moderate visual effect on the aesthetics of cultural sites.	ML	H
Abiotic			
5. Impact flow?	As it is "unlikely to tolerate permanently saturated soils" (Williams et al, 1999), it is unlikely to grow near enough to waterways to impact on them.	L	H
6. Impact water quality?	As it is "unlikely to tolerate permanently saturated soils" (Williams et al, 1999), it is unlikely to grow near enough to waterways to impact on them.	L	H
7. Increase soil erosion?	Displacing low-growing herbs and ferns and preventing establishment of native seedlings (Dept. cons., 2002). Ability to dominate understorey vegetation in open damp areas (CRC Weed Management, 2003). Given its ability to replace native vegetation and that "in drought conditions it may not grow at all over summer" (Williams et al., 1999), <i>S. glastifolius</i> may leave patches of soil that could be prone to soil erosion until there is enough soil moisture for the <i>Senecio</i> to germinate and establish. Without evidence of this having happened and no record of it forming monocultures, the likelihood of this occurring is presumed moderate, given the chain of events that would have to occur.	ML	MH
8. Reduce biomass?	"Seems to have a particular affinity for the open areas of scree and bare ground between the shrubs...[some species] vulnerable to shading by the invasion" (Williams et al,1999). When colonising bare ground this plant would increase biomass. Where it prevents the establishment of native vegetation it may replace or slightly increase or decrease biomass depending on the type of vegetation that it supresses. Given the sparse nature of the sites that it tends to invade and its "strong association with sparsely vegetated sites," (Williams et al, 1999) on balance it is likely to slightly increase biomass, but as a short-lived perennial will not act as a carbon sink.	ML	H
9. Change fire regime?	Whilst fire seems to stimulate germination (see Brown & Brooks, 2002), there is no evidence of mature plants surviving fire. As an herbaceous perennial (ie not woody) that tends to fall over as it grows older (Williams, 1999) there is no evidence that it provides fuel for fire. As it can replace native vegetation, it has the potential to reduce the incidence and perhaps the intensity of fires in some vegetation types eg. Grasslands and possible heaths, but the effect would probably be minor.	ML	H

Impact Assessment Record

Scientific Name: *Senecio glastifolius* L. f.

Common name: holly leaved senecio

QUESTION	COMMENTS	RATING	CONFIDENCE
Community Habitat			
10. Impact on composition (a) high value EVC	EVC=Coast Banksia Woodland (V), CMA=West Gippsland, Bioreg.=Gippsland Plain, CLIMATE=VH. Ability to dominate understorey vegetation in open damp areas (CRC Weed Management). There is the potential for this plant to cause major displacement of some dominant species in the grass and herb layers.	MH	MH
(b) medium value EVC	EVC=Coastal Alkaline Scrub (D), CMA=West Gippsland, Bioreg.=Gippsland Plain, CLIMATE=VH. Ability to dominate understorey vegetation in open damp areas (CRC Weed Management). There is the potential for this plant to cause major displacement of some dominant species in the grass and herb layers.	MH	MH
(c) low value EVC	EVC=Heathy Woodland (LC), CMA=West Gippsland, Bioreg.=Gippsland Plain, CLIMATE=VH. Ability to dominate understorey vegetation in open damp areas (CRC Weed Management). There is the potential for this plant to cause major displacement of some dominant species in the grass and herb layers.	MH	MH
11. Impact on structure?	Ability to dominate understorey vegetation in open damp areas (CRC Weed Management). There is the potential for this plant to have a major effect on the grass and herb layers and a minor effect on the low shrub layer of some communities.	MH	MH
12. Effect on threatened flora?	No information found.	MH	L
Fauna			
13. Effect on threatened fauna?	No information found.	MH	L
14. Effect on non-threatened fauna?	Displacing low-growing herbs and ferns and preventing establishment of native seedlings (Dept. cons., 2002). Ability to dominate understorey vegetation in open damp areas (CRC Weed Management, 2003). There is the potential for a minor effect on food sources and/or shelter for some fauna.	ML	MH
15. Benefits fauna?	As it is eaten by the larvae of the native magpie moth and diurnal moth in NZ and seems to be palatable to sheep (Williams et al, 1999), it may provide an alternative food source for some animals.	L	H
16. Injurious to fauna?	Although it is somewhat prickly (Williams, 1999), <i>S. glastifolius</i> is unlikely to cause fauna to lose condition.	L	H
Pest Animal			
17. Food source to pests?	Although recorded as palatable it is not noted as a food source for pests in Williams et al (1999).	L	H
18. Provides harbor?	As an herbaceous perennial with widely spaced branches (CRC Weed Management, 2003), this plant is unlikely to provide habitat or harbor for pest species.	L	MH
Agriculture			
19. Impact yield?	Occurs naturally in pastoral areas A general agricultural weed (Williams et al, 1999). However it is palatable to sheep (Williams et al, 1999), so it may simply provide an alternative fodder source and its ability to outcompete pasture would probably be controlled by grazing.	L	H

Impact Assessment Record

Scientific Name: *Senecio glastifolius* L. f.

Common name: holly leaved senecio

QUESTION	COMMENTS	RATING	CONFIDENCE
20. Impact quality?	See q. 19, the plant is unlikely to reduce form in stock and does not have spines or burrs that might affect meat or wool quality.	L	H
21. Affect land value?	See q. 19, without significantly reducing yield or quality, land value is unlikely to be affected.	L	H
22. Change land use?	Would not require a change in land use.	L	H
23. Increase harvest costs?	"A troublesome weed in newly planted plantations" (Williams et al, 1999). Possibly increases harvest costs in weed control costs.	M	L
24. Disease host/vector?	None recorded	L	L

References cited:

Brown K & Brooks K 2002, *Bushland Weeds* Environmental Weeds Action Network, Australia.

CRC Weed Management 2003, *Weed Management Guide: Holly leaved senecio* – *Senecio glastifolius*, Australia.

Dept. cons. (Department of Conservation) *Have you seen these plants on Matiu/Somes Island?* (2002) NZ

van Der Walt, L 2002, *PlantZAfrica.com*, South African National Biodiversity Institute, viewed: 21/11/2005, www.plantzafrica.com/plantqrs/senecioglast.htm.

Williams, PA, Ogle, CC, Timmins, SM, La Cock, F & Reid, V 1999, 'Biology and ecology of *Senecio glastifolius* and its spread and impacts in New Zealand' *Science for Conservation* vol. 112, Department of Conservation, New Zealand

Revisions

Date Revised by Revision

Invasiveness Assessment Record

Scientific name: *Tamarix aphylla* (L.) H. Karst.

Common Name: athel pine

QUESTION	COMMENTS	RATING	CONFIDENCE
Establishment			
Germination requirements?	Germinate all year round so long as moisture is available (ARMCANZ, 2000). Opportunistic germinator.	H	MH
Establishment requirements?	Requires extended periods of soil saturation for establishment (PAC, 2005). Thrives in full sun conditions (Parsons & Cuthbertson, 2001). No evidence to support that the tree can establish under moderate canopy.	ML	MH
How much disturbance is required?	Generally restricted to watercourses and commonly occurs on salt flats, springs and along streams and rivers (ARMCANZ, 2000; Forest Service, 2003).	MH	MH
Growth/Competitive			
Life form?	Evergreen tree (PAC, 2005). Other	L	MH
Allelopathic properties?	None described.	L	L
Tolerates herb pressure?	Foliage has few leaf-eating insects with no known pests in Australia but does have natural pests in native habitat (Beckmann, 1990). Leaves unpalatable to livestock and wildlife (PAC, 2005).	H	MH
Normal growth rate?	Can out compete native vegetation. Seedlings establish readily and growth is also rapid. Displaces Eucalypts and other native vegetation (ARMCANZ, 2000).	H	MH
Stress tolerance to frost, drought, w/logg, sal. etc?	Can tolerate saline water. Highly fire resistant and drought resistant (ARMCANZ, 2000). Flooding can be used to control it if root crowns stay submerged for at least three months (PAC, 2005).	MH	MH
Reproduction			
Reproductive system	Capable of both sexual and vegetative (roots or stems) production although vegetative production from broken branches is more common [than from seeds] as it is believed the seeds are only viable for a very short period of time (ARMCANZ, 2000).	H	MH
Number of propagules produced?	'A single [tree] may produce hundreds of thousands of seeds' (WSDE 2004).	H	MH
Propagule longevity?	Seeds remain viable for a few weeks only (Beckmann, 1990).	L	H
Reproductive period?	Aggressive coloniser often forming monotypic stands (WSDE, 2004).	H	MH
Time to reproductive maturity?	Start producing seeds after 2 to 3 years in reasonably good conditions (Beckmann, 1990).	ML	H
Dispersal			
Number of mechanisms?	Light seeds well adapted to wind dispersal (ARMCANZ, 2000). Dispersed by water (especially floodwaters). May be dispersed by animals and birds (Parsons & Cuthbertson, 2001).	H	MH

Invasiveness Assessment Record

Scientific name: *Tamarix aphylla* (L.) H. Karst.

Common Name: athel pine

QUESTION	COMMENTS	RATING	CONFIDENCE
How far do they disperse?	Thought to spread long distances in floodwaters and as also spread by birds (Parsons & Cuthbertson, 2001) it is very likely that some propagules will disperse greater than 1 km.	H	MH

References cited:

Agriculture & Resource Management Council of Australia and New Zealand, Australian & New Zealand Environment Conservation Council and Forestry Ministers 2000, *Weeds of national significance Athel pine (Tamarix aphylla): strategic plan*, National Weeds Strategy Executive Committee, Launceston.

Beckmann, R 1990, 'Athels inland', *Ecos*, vol. 63, pp. 18-20.

Parson, W T & Cuthbertson, E G 2001, *Noxious weeds of Australia*, 2nd ed., CSIRO Publishing, Collingwood.

Plant Conservation Alliance 2005, *Saltcedar*, Alien Plant Working Group, Washington, viewed: 28 July 2005, <http://www.nps.gov/plants/alien/fact/tama1.htm>

Forest Service 2003, *Tamarix aphylla*, United States Department of Agriculture Forest Service, Washington, viewed: 09 July 2005, <http://www.fs.fed.us/database/feis/plants/tree/tamaph/>

Washington State Department of Ecology 2004, *Non-native freshwater plants: salt cedar*, Access Washington, Washington, viewed: 28 July 2005, <http://www.ecy.wa.gov/programs/wq/plants/weeds/aqua013.html>

Revisions

Date	Revised by	Revision

Present distribution of *Tamarix aphylla* in Victoria

Scientific name: *Tamarix aphylla* (L.) Karst.

Common name(s): athel pine, tamarisk

Status:

Habitat:

Semi-arid to arid warm-temperate or subtropical regions, preferably in full sun and on light to medium loams. (Parsons & Cuthbertson 2001). Disturbed and undisturbed streams, waterways, bottomlands, banks and drainage channels, moist rangelands and pastures. (PAC 2005).



Potential distribution of *Tamarix aphylla* in Victoria

Scientific name: *Tamarix aphylla* (L.) Karst.

Common name(s): athel pine, tamarisk

Status:

Habitat:

Semi-arid to arid warm-temperate or subtropical regions, preferably in full sun and on light to medium loams. (Parsons & Cuthbertson 2001). Disturbed and undisturbed streams, waterways, bottomlands, banks and drainage channels, moist rangelands and pastures. (PAC 2005).

Potential distribution produced from CLIMATE modelling refined by applying suitable landuse and vegetation type overlays with CMA boundaries

MAP OVERLAYS USED.

Land Use:

Pasture irrigation

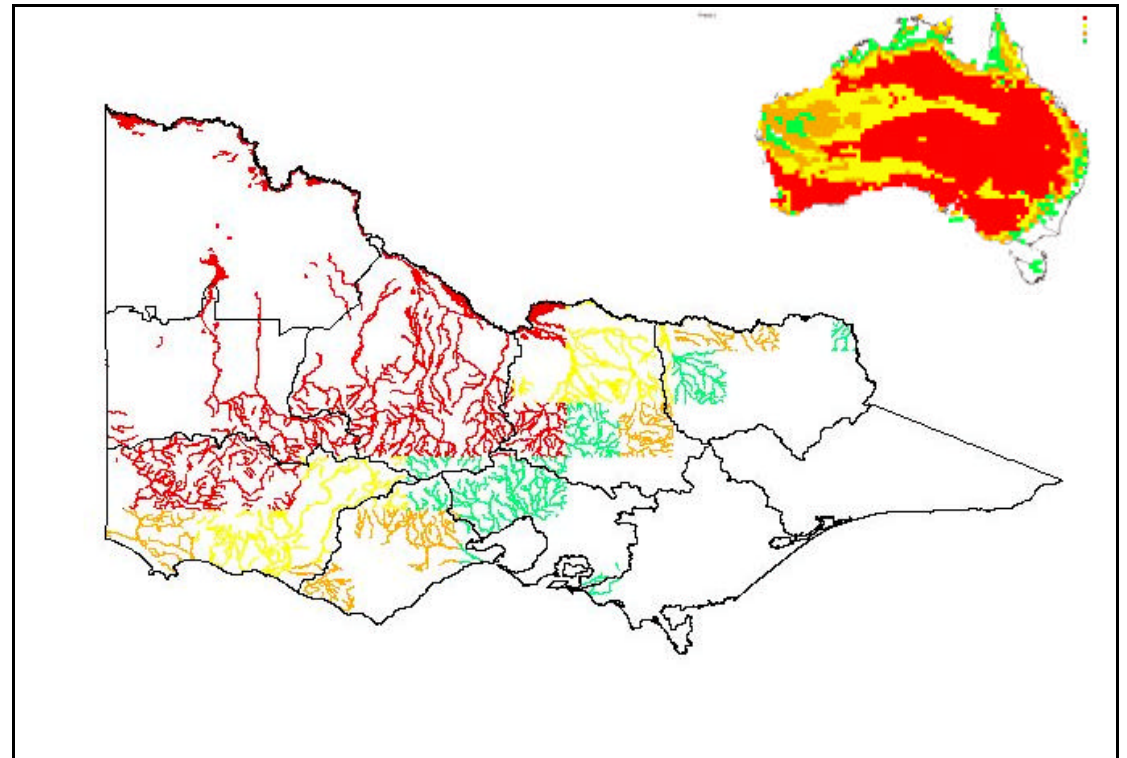
Broad vegetation types

Swamp scrub; riverine grassy woodland; riparian forest

Colours indicate possibility of *Tamarix aphylla* infesting these areas.

Red	= Very high	Yellow	= High
Orange	= Medium	Green	= Likely

In the non-coloured areas the plant is unlikely to establish as the climate, soil or landuse is not presently suitable.



Impact Assessment Record

Scientific Name: *Tamarix aphylla*

Common name: athel pine, tamarisk

QUESTION	COMMENTS	REFERENCE	RANKING
Social			
1. Restrict human access?	"A small spreading tree to 10 m high. [It] branches almost from the base and can be an extremely useful breakwind and shade tree." Well established, dense infestations may be a major impediment to humans.	P & C (2001)	MH
2. Reduce tourism?	In some infestations in Australia, it forms a monoculture. Likely to have a serious impact on aesthetics.	P & C (2001)	MH
3. Injurious to people?	The plant has no known toxic or potentially injurious properties.		L
4. Damage to cultural sites?	The root system comprises a strong woody rootstock with and extensive web of deeply penetrating secondary and succeeding roots. 'It threatens heritage buildings by disrupting foundations and walls'. The potential to have a moderate structural effect.	P & C (2001), ARMCANZ (2001)	MH
Abiotic			
5. Impact flow?	In Australia, it is naturalised along the banks of permanent and ephemeral river systems in the Northern Territory. It does not affect flow.	P & C (2001)	L
6. Impact water quality?	Terrestrial species	P & C (2001)	L
7. Increase soil erosion?	"It is also useful in stabilising moving sand dunes or mullock heaps." Deep, extensive root system. Tree provides permanent cover. Would not contribute to erosion.	P & C (2001)	L
8. Reduce biomass?	It has replaced dominant native species (<i>Eucalyptus carnaldulensis</i> and <i>E. microtheca</i>) along the Finke River N.T. Invader replaces biomass.	P & C (2001)	ML
9. Change fire regime?	"Athel tamarisk is a fire-adapted species. The high ash content and salt content of its foliage make it hard to burn even when dry. Because of their fire-resistant qualities of Athel tamarisk foliage, it is a good species for use in fire shelterbelts."	Tesky (1992)	L
Community Habitat			
10. Impact on composition (a) high value EVC	EVC=Blackbox chenopod woodland (E); CMA=Goulburn Broken; Bioreg=Victorian Riverina; Climate=VH. "It...exudes large quantities of salt through the leaves, salting the surrounding soil. Athel pine displaces Eucalypts and other native vegetation with fewer native herbs persisting in areas of thick athel pine." Major displacement of species in mid stratum.	ARMCANZ (2001)	MH
(b) medium value EVC	EVC= Lignum swampy woodland (D); CMA=North Central; Bioreg=Murray Mallee; Climate=VH.		MH
(c) low value EVC	EVC= Riparian Forest (LC); CMA=Goulburn Broken; Bioreg=Highlands-Northern =Fall; Climate=VH.		MH
11. Impact on structure?	In some infestations in Australia, it forms a monoculture. Serious impact in all strata.	P & C (2001)	H
12. Effect on threatened flora?	This species is not documented as posing an additional risk to threatened flora.		MH

Impact Assessment Record

Scientific Name: *Tamarix aphylla*

Common name: athel pine, tamarisk

QUESTION	COMMENTS	REFERENCE	RANKING
Fauna			
13. Effect on threatened fauna?	This species is not documented as posing an additional risk to threatened fauna.		MH
14. Effect on non-threatened fauna?	"...the replacement of the native trees not only reduces bird abundance, it also changes the structure of bird communities. Reptiles...were also affected." Reduces habitat leading to a reduction in numbers.	Beckmann (1990)	MH
15. Benefits fauna?	No known benefits. Dense growth may provide shelter for small bird species.	Beckmann (1990)	H
16. Injurious to fauna?	No known toxic principles. "Athel tamarisk foliage contains phenolic acids which may prevent herbivory."	Tesky (1992)	L
Pest Animal			
17. Food source to pests?	Not known as food source to pests. See comment in Q16 above.		L
18. Provides harbor?	Not known to provide harbor.		L
Agriculture			
19. Impact yield?	Where it has occurred along the Finke River N.T., it has, "...considerably reduced the available grazing area." Potential to have a major impact on the quantity of yield by reducing carrying capacity.	P & C (2001)	MH
20. Impact quality?	Not a weed of cropping. Plants take 2 to 3 years to flower. No burrs; plants are not grazed.	P & C (2001)	L
21. Affect land value?	Primarily a weed of natural ecosystems. Unlikely to affect the value of grazing land.		L
22. Change land use?	Primarily a weed of natural ecosystems. Change in land use not required.		L
23. Increase harvest costs?	Not a weed of cropping.		L
24. Disease host/vector?	None evident.		L

References:

Agriculture and Resource Management Council of Australia & New Zealand, Australian & New Zealand Environment & Conservation Council and Forestry Ministers, (2001) *Weeds of National Significance Athel Pine (Tamarix aphylla) Strategic Plan*. National Weeds Strategy Executive Committee, Launceston.

Beckmann, R. 1990. *Athels inland*. Ecos 63, Autumn 1990. Available:

http://www.publish.csiro.au/ecos/view/dsp_download.cfm?article_id=EC63p18.pdf&issue_id=63&issue_year=1990 Accessed 08/07/03

Tesky, J. 1992. *Tamarix aphylla*. United States Forest Service, Fire Effects Information System. Available: <http://www.fs.fed.us/database/feis/plants/tree/tamaph/all.html> Last accessed 09/07/03

Invasiveness Assessment Record

Scientific name: *Thunbergia laurifolia* Lindl.

Common Name: laurel clock vine

QUESTION	COMMENTS	REFERENCE	CONFIDENCE
Establishment			
1. Germination requirements?	"Each time [a stem] falls to the ground it takes root" (CRC Weed Management, 2003).	H	M
2. Establishment requirements?	Protected, partly shaded position recommended for horticultural plantings (Bodkin, 1990). However, pictures of the vine (Starr, 2002), and the types of vegetation that it invades (Starr, Starr & Loop, 2003) suggest that it needs access to light.	ML	MH
3. How much disturbance is required?	Mostly lowland moist disturbed areas; Sparingly adventive along hiking trails or margins of urban areas; Spreading vegetatively from planting into nearby disturbed lowland scrub; Remnant wet forests and coastal river habitat (Starr, Starr & Loop, 2003). Roadsides, pastures and headlands of canefields (CRC Weed Management, 2003). Establishes in highly disturbed natural ecosystems.	ML	MH
Growth/Competitive			
4. Life form?	Climbing vine (PIER, 2005).	ML	MH
5. Allelopathic properties?	None found in CRC Weed Management (2003).	L	M
6. Tolerates herb pressure?	Very tuberous rootsystem which can resprout from many dormant buds when cut, but no record of herbivory in CRC Weed Management (2003).	H	M
7. Normal growth rate?	Aggressive...attaining height up to at least 15m (Starr, Starr & Loop, 2003). Large, aggressive vine...capacity to smother coastal, lowland rainforest (Csurhes & Edwards, 1998).	H	MH
8. Stress tolerance to frost, drought, w/logg, sal. etc?	Young plants die back when temperatures drop below freezing point. Commonly found in damp areas (CRC Weed Management, 2003), and Bodkin (1990) notes that it is drought and frost tender. Tolerant of one and susceptible to at least two stressors.	L	M
Reproduction			
9. Reproductive system	Seeds, cuttings and fragments of stems and roots (PIER, 2005).	H	MH
10. Number of propagules produced?	Most literature indicates that the vine is sterile, mostly reproducing by vegetative means. However, in Johnson Shire <i>T. laurifolia</i> has been observed growing from seed, which is quite unusual. Images in CRC publication suggest that if seeding were to occur, probably more than 1000 seeds could be produced per flowering event (CRC Weed Management, 2003).	MH	M
11. Propagule longevity?	Tubers numerous and large, often the size of a 4WD vehicle. Uncommonly produces viable seed and is assumed to reproduce vegetatively most of the time (CRC Weed Management, 2003).	L	M

Invasiveness Assessment Record

Scientific name: *Thunbergia laurifolia* Lindl.

Common Name: laurel clock vine

12. Reproductive period?	Individual patches completely cover several hectares, eventually leading to the destruction of most other vegetation (CRC Weed Management, 2003). Photographs show <i>T. laurifolia</i> forming dense monocultures (Starr, 2002).	H	MH
13. Time to reproductive maturity?	No data available. Mostly known to reproduce vegetatively	M	L
Dispersal			
14. Number of mechanisms?	Seeds, cuttings and fragments of stems and roots (PIER, 2005). Contaminated fill. Careless disposal of garden waste. Infestations along riverbanks have been caused by root pieces...being transported by floodwaters (CRC Weed Management, 2003).	MH	MH
15. How far do they disperse?	Can spread from dumping of garden cuttings (PIER, 2005). Also floodwaters (see number of mechanisms) and stem/root fragments. Most propagation is vegetative and some vegetative pieces could be transported km by people and water, but most would be unlikely to disperse more than 200m.	ML	MH

References cited:

Bodkin, F 1990, *Encyclopaedia Botanica*, Angus & Robertson, Australia.

CRC Weed Management 2003, *Weed management guide Laurel clock vine* (*Thunbergia laurifolia*), CRC Weed Management, Australia.

Csurhes, S, & Edwards, R 1998, Department of the Environment and Heritage, Australian Government, viewed: 08/12/2005,

www.deh.gov.au/biodiversity/invasive/publications/index.html.

PIER (Pacific Island Ecosystems at Risk) 2005, *Hawaiian Ecosystems at Risk project (HEAR)*, US Geological Survey, viewed: 11/07/2005,

www.hear.org/pier/species/thunbergia_laurifolia.htm.

Starr, F & K 2002, *Hawaiian Ecosystems at Risk project (HEAR)*, US Geological Survey, viewed: 12/08/2005,

www.hear.org/starr/hiplants/images/thumbnails/html/thunbergia_laurifolia.htm

Starr, F, Starr, K, Loope, L 2003, *Hawaiian Ecosystems at Risk project (HEAR)*, US Geological Survey, viewed: 11/07/2005,

www.hear.org/starr/hiplants/reports/html/thunbergia_laurifolia.htm

Revisions

Date Revised by Revision

Present distribution of *Thunbergia laurifolia* in Victoria

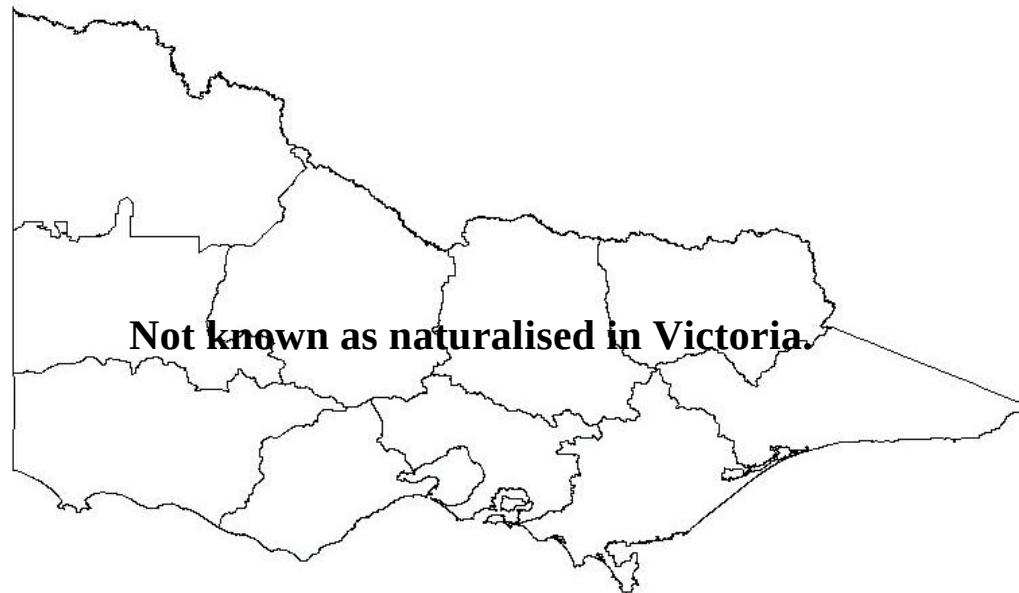
Scientific name: *Thunbergia laurifolia* Lindl.

Common name(s): laurel clock vine

Status:

Habitat:

Native to India and Malaysia, prefers rich, moist, well-drained soils in a protected, partially shaded position, sensitive to frost (Bodkin 1990). Likes moist areas at low elevations (PIER 2005). In Australia, it invades remnant wet forests and coastal river habitat (Starr *et al* 2003).



Potential distribution of *Thunbergia laurifolia* in Victoria

Scientific name: *Thunbergia laurifolia* Lindl.

Common name(s): laurel clock vine

Status:

Habitat:

Native to India and Malaysia, prefers rich, moist, well-drained soils in a protected, partially shaded position, sensitive to frost (Bodkin 1990). Likes moist areas at low elevations (PIER 2005). In Australia, it invades remnant wet forests and coastal river habitat (Starr *et al* 2003).

Potential distribution produced from CLIMATE modelling refined by applying suitable landuse and vegetation type overlays with CMA boundaries

MAP OVERLAYS USED.

Land Use:

Broadacre cropping

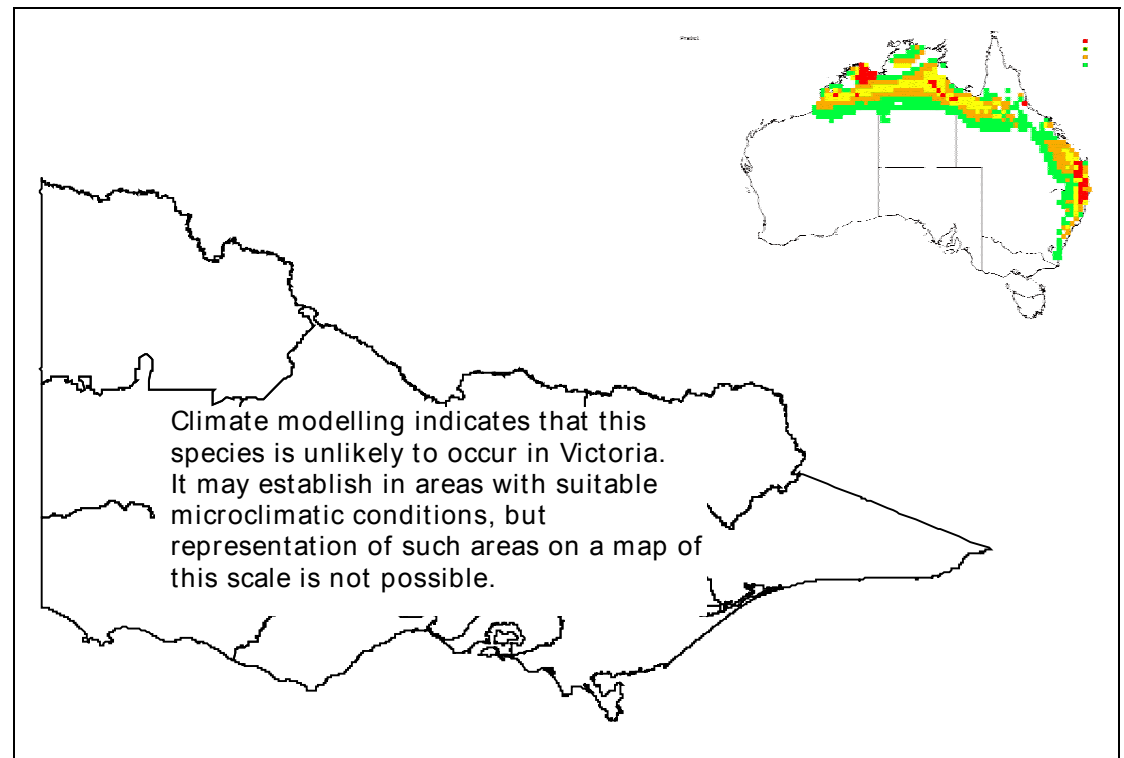
Broad vegetation types

Lowland forest

Colours indicate possibility of *Thunbergia laurifolia* infesting these areas.

 Red	= Very high	 Yellow	= High
 Orange	= Medium	 Green	= Likely

In the non-coloured areas the plant is unlikely to establish as the climate, soil or landuse is not presently suitable.



Impact Assessment Record

Scientific Name: *Thunbergia laurifolia* Lindl.

Common name: laurel clock vine

QUESTION	COMMENTS	RATING	CONFIDENCE
Social			
1. Restrict human access?	A “vigorous, perennial climbing vine...forming impenetrable colonies” (CRC Weed Management, 2003). See also the picture in this reference depicting a wall of vine that would be a major impediment to access.	H	M
2. Reduce tourism?	The extent of these infestations would be obvious to most visitors and it also has the ability to “pull down mature trees” with their weight and in lower layers of vegetation, “killing many plants” (NR & M, 2005). This would render natural areas extremely unappealing to most potential visitors.	H	M
3. Injurious to people?	No spines, burrs or toxins noted in CRC Weed Management (2003).	L	M
4. Damage to cultural sites?	“Large tubers can cause damage to paths, fences and foundations” ” (NR & M, 2005) as well as the devastating effects on natural environments described in Q. 11. This plant could cause major structural damage to sites and obliteration of cultural features.	H	M
Abiotic			
5. Impact flow?	Infests areas along coastal streams ” (NR & M, 2005) and with its ability to pull down mature trees, could cause obstructions in waterways that might have a major effect on either subsurface or surface flow, depending on where the tree falls and how large it is.	MH	M
6. Impact water quality?	Unlikely to have an impact on water quality as it is a terrestrial species not noted as growing in water (CRC Weed Management, 2003)..	L	M
7. Increase soil erosion?	Where this plant pulls down trees (see Q. 2) and exposes soil, erosion is likely to occur.	ML	M
8. Reduce biomass?	Biomass will be significantly reduced by this plant where it kills and replaces large woody vegetation (see Q. 2).	H	M
9. Change fire regime?	Where the less specialised <i>Thunbergia</i> replaces scleromorphic vegetation (see Q. 2) it is likely to greatly reduce the frequency and intensity of fire, an important mechanism even in rainforest (Groves, ed., 1994).	H	H
Community Habitat			
10. Impact on composition (a) high value EVC	Potential distribution analysis shows that this species is not likely to occur as an invasive plant in Victoria.	L	H
(b) medium value EVC	Potential distribution analysis shows that this species is not likely to occur as an invasive plant in Victoria.	L	H
(c) low value EVC	Potential distribution analysis shows that this species is not likely to occur as an invasive plant in Victoria.	L	H
11. Impact on structure?	“The plant climbs and blankets native vegetation often pulling down mature trees with the weight of the vine. Smothered vegetation also has dramatically reduced light levels to lower layers of vegetation drastically limiting growth, and killing many plants” ” (NR & M, 2005). This plant could have a major effect on all layers in a community, killing trees as well as lower vegetation layers.	H	M

Impact Assessment Record

Scientific Name: *Thunbergia laurifolia* Lindl.

Common name: laurel clock vine

QUESTION	COMMENTS	RATING	CONFIDENCE
12. Effect on threatened flora?	Potential distribution analysis shows that this species is not likely to occur as an invasive plant in Victoria.	L	H
Fauna			
13. Effect on threatened fauna?	Potential distribution analysis shows that this species is not likely to occur as an invasive plant in Victoria.	L	H
14. Effect on non-threatened fauna?	This vine's ability to replace almost all the flora in a community (see Q. 11), dramatically changes habitat, leading to the possible extirpation of fauna species.	H	M
15. Benefits fauna?	Provides very little support for desirable species as it "blankets native vegetation" (CRC Weed Management, 2003), reducing habitat value.	H	M
16. Injurious to fauna?	No spines, burrs, toxins etc. noted in CRC Weed Management (2003).	L	M
Pest Animal			
17. Food source to pests?	Not noted as a food source for pests.	L	L
18. Provides harbor?	In blanketing vegetation (CRC Weed Management, 2003) this vine creates potential harbour for foxes and wild pigs.	H	M
Agriculture			
19. Impact yield?	"In agricultural areas it infests roadsides, pastures and headlands of canefields, forming impenetrable colonies" (CRC Weed Management, 2003). Not recorded as palatable to herbivores, so there is the potential for it to reduce the carrying capacity of invaded pasture. The extent would depend on the infestation of which no data could be found, so a medium score was chosen.	M	L
20. Impact quality?	No spines, burrs, toxicity noted in CRC Weed Management (2003).	L	M
21. Affect land value?	See Q. 19. This plant would be very obvious in a pasture, so if it colonises large areas, with an ability to significantly reduce yield it would reduce land value, but there is no evidence for this, so a medium value was chosen.	M	L
22. Change land use?	See Q. 20. Large enough infestations may force a change from pasture to cropping (where the plant is only recorded in headlands of cane fields (CRC Weed Management, 2003) and so is probably a viable alternative. No information about the extent of pasture infestations is available though.	M	L
23. Increase harvest costs?	Not noted as a weed of cropping (just canefield headlands in CRC Weed Management, 2003), so should not increase harvest costs.	L	MH
24. Disease host/vector?	" <i>Thunbergia</i> species are susceptible to spider mites, whiteflies and scale insects" (Starr, Starr & Loope, 2003). These pest species are a problem in agricultural crops, however they are not uncommon, so infestations on this plant probably won't increase infection rates by much, if at all.	MH	MH

Impact Assessment Record

Scientific Name: *Thunbergia laurifolia* Lindl.

Common name: laurel clock vine

References cited:

CRC Weed Management 2003, *Weed Management Guide- Laurel clock vine- Thunbergia laurifolia*, CRC Weed Management, Australia.

Groves RH (ed) 1994, *Australian Vegetation* (2nd ed.), Cambridge University Press, Australia.

Natural Resources and Mines (NR&M) 2005, '*Thunbergia* Blue trumpet vine,' *facts pest series*, Land Protection, QLD.

Sarr, F, Sarr, K, Loope, L 2003, *Hawaiian Ecosystems at Risk project (HEAR)*, US Geological Survey, viewed: 11/07/2005,

www.hear.org/sarr/hiplants/reports/html/thunbergia_laurifolia.htm.

Date	Revised by	Revision

Invasiveness Assessment Record

Scientific name: *Tipuana tipu* (Benth.) Duntze

Common Name: Rosewood

QUESTION	COMMENTS	RATING	CONFIDENCE
Establishment			
1. Germination requirements?	Seed germinates April-Aug (from growth calendar). Germination is highest in winter, when ample water is available (CRC Weed Management, 2003). Propagation by scarified seed (Bodkin, 1990). Fresh scarified seed in Spring (Page & Olds, 1998). Despite inconsistencies in the data, all suggest that adequate, but seasonal, rainfall and temperature is required to break a dormancy imposed by the seed coating.	MH	M
2. Establishment requirements?	Pioneer species, dominating early forest successional stages (Grau et al., 1996). Open, sunny position (Bodkin, 1990). Requires access to direct light to establish.	ML	M
3. How much disturbance is required?	Invades disturbed sites such as roadsides and creekbanks, and also grows in woodland and open grassland areas where grazing is absent. Able to spread rapidly into woodlands, firebreaks, tracks, roadsides and other open areas (CRC Weed Management, 2003). Able to establish in natural ecosystems that are relatively intact or have only minor disturbance.	MH	M
Growth/Competitive			
4. Life form?	Family Fabaceae (Cruz et. al., 2002)– leguminous plant.	MH	MH
5. Allelopathic properties?	None recorded in CRC Weed Management (2003).	L	M
6. Tolerates herb pressure?	In Bolivia...considered the most important fodder species...regrows well after grazing (Cruz et. al., 2002). Cattle will eat new growth and thus kill rosewood seedlings (CRC Weed Management, 2003). Mature trees will be able to continue reproducing under herbivory pressure, as tree can reach heights variously reported from 10m to 30m (beyond the reach of stock) and seed is wind-dispersed (CRC Weed Management, 2003), with the potential to germinate beyond the fenceline.	ML	MH
7. Normal growth rate?	Fast growth rate (Cruz et. al., 2002). Up to 4m in first two years of growth (CRC Weed Management, 2003)	H	MH
8. Stress tolerance to frost, drought, w/logg, sal. etc?	Drought resistant, tolerates temperatures below 0°C and survives very high levels of salinity (Cruz et. al., 2002). This contrasts with findings by Dunn et al. (1994) that <i>T. tipu</i> has poor survival in saline soils. This tree probably has some tolerance to salt, but could not be considered highly salt tolerant. Drought and frost tender when young (Bodkin, 1990). Will survive in temperatures down to minus 6.5°C (CRC Weed Management, 2003), which may refer to mature trees. The susceptibility of young trees to drought and frost puts this species in the lowest threat category.	L	M
Reproduction			
9. Reproductive system	Flowers bisexual. Pollinated by bees (Cruz et. al., 2002). Sexual reproduction only. Will tend towards the medium value in the absence of more specific data	ML	L

Invasiveness Assessment Record

Scientific name: *Tipuana tipu* (Benth.) Duntze

Common Name: Rosewood

QUESTION	COMMENTS	RATING	CONFIDENCE
10. Number of propagules produced?	Ability to produce many seeds and achieve high germination rates...up to 10 000 seeds per plant (CRC Weed Management, 2003).	H	M
11. Propagule longevity?	Orthodox seed. If stored at low moisture content at low temperatures, they can retain full viability for several years (Cruz et. al., 2002). Presume less than 5 years	L	MH
12. Reproductive period?	A pioneer species, still present in secondary forests 20-50 years old (Grau et al., 1996). This indicates that the trees live for at least 20 years, producing seed from the age of 8-10 years (see Q 13 below)	H	H
13. Time to reproductive maturity?	Trees normally start to set fruit when they are 8-10 years old (Cruz et. al., 2002).	L	MH
Dispersal			
14. Number of mechanisms?	Winged pod (samara) (Cruz et. al., 2002). Wind and water (when near waterways). Does not spread vegetatively (CRC Weed Management, 2003).	MH	M
15. How far do they disperse?	Depending on wind velocity and distance above the ground, rosewood seeds can be carried considerable distances away from the parent plant (CRC Weed Management, 2003). Water dispersal (see Q. 14) may sometimes carry them further. Most propagules will disperse 20-200m, very few will disperse to 1km.	ML	M

References cited:

Bodkin, F, 1990, *Encyclopaedia Botanica*, Angus & Robertson, Australia.

Cruz, NT, Morales, MU, Rojas, E & Joker, D 2002, *Seed Leaflet*, No. 55, Danida Forest Seed Centre, Denmark.

CRC Weed Management 2003, *Weed management guide Rosewood or tipuana tree- Tipuana tipu*, CRC Weed Management, Australia.

Dunn, GM, Taylor, DW, Nester, MR & Beetson, TB 1994, 'Performance of twelve selected Australian tree species on a saline site in southeast Queensland' *Forest Ecology and Management*, vol. 70, pp. 255-264.

Grau, HR, Arturi, MF, Brown, AD & Aceñolaza, PG 1996, 'Floristic and structural patterns along a chronosequence of secondary forest succession in Argentinean subtropical montane forests' *Forest Ecology and Management*, vol. 95, pp. 161-171.

Page, S & Olds, M (eds.) 1998, *Botanica*, Random House, Australia.

Revisions

Date Revised by Revision

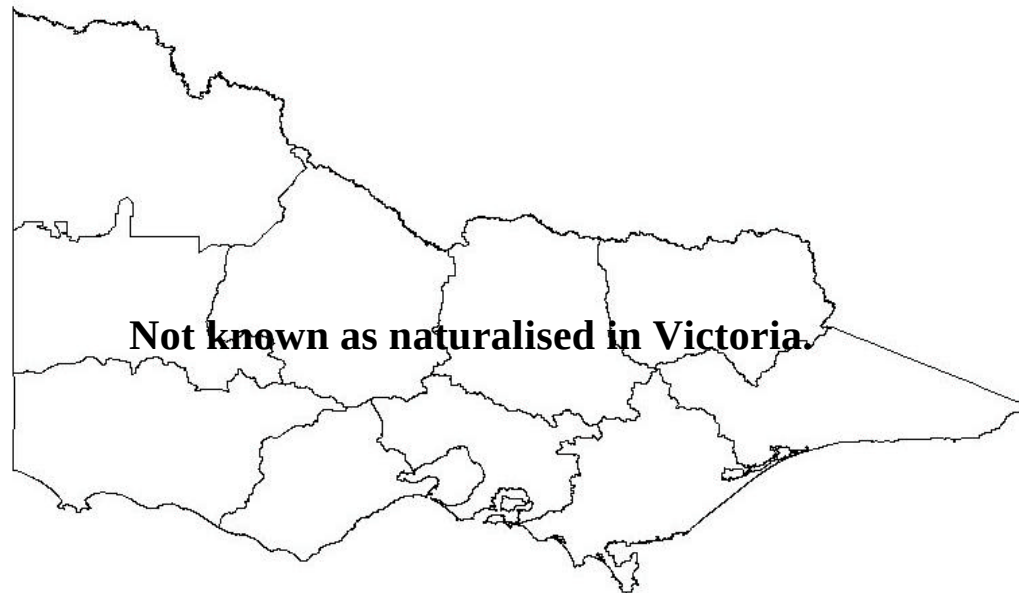
Present distribution of *Tipuana tipu* in Victoria

Scientific name: *Tipuana tipu* (Benth.) Kuntze

Common name(s): rosewood, tipuana tree

Status:

Habitat: Native to southern Bolivia and northern Argentina. Common in gallery forests of the Andes, found in both valleys and mountain forests up to 2900 m. Grows under a wide range of climatic conditions and tolerates a variety of soils although prefers soils with good drainage. Grow on foothills and borders of dry farming lands (Cruz et al 2002). Grows in subtropical environment with warm year-round temperatures in native range. Grows well in moist conditions and will survive temperatures to minus 6.5°C. Invades disturbed sites such as roadsides and creekbanks, also grows in woodland and open grassland areas with an absence of grazing (CRC for Australian Weed Management 2003).



Potential distribution of *Tipuana tipu* in Victoria

Scientific name: *Tipuana tipu* (Benth.) Kuntze

Common name(s): rosewood, tipuana tree

Status:

Habitat: Native to southern Bolivia and northern Argentina. Common in gallery forests of the Andes, found in both valleys and mountain forests up to 2900 m. Grows under a wide range of climatic conditions and tolerates a variety of soils although prefers soils with good drainage. Grow on foothills and borders of dry farming lands (Cruz et al 2002). Grows in subtropical environment with warm year-round temperatures in native range. Grows well in moist conditions and will survive temperatures to minus 6.5°C. Invades disturbed sites such as roadsides and creekbanks, also grows in woodland and open grassland areas with an absence of grazing (CRC for Australian Weed Management 2003).

Potential distribution produced from CLIMATE modelling refined by applying suitable landuse and vegetation type overlays with CMA boundaries

MAP OVERLAYS USED.

Land Use:

Pasture dryland
Pasture irrigation

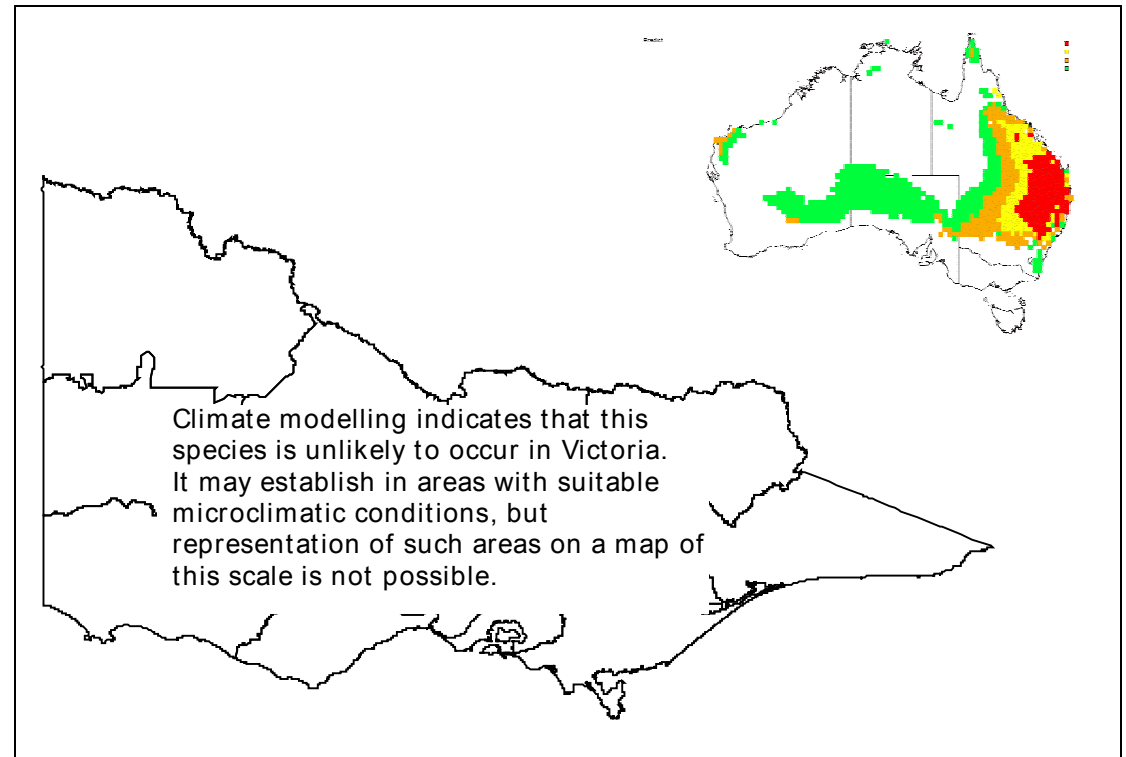
Broad vegetation types

Montane moist forest; grassland; riverine grassy woodland; riparian forest

Colours indicate possibility of *Tipuana tipu* infesting these areas.

Red	= Very high	Yellow	= High
Orange	= Medium	Green	= Likely

In the non-coloured areas the plant is unlikely to establish as the climate, soil or landuse is not presently suitable.



Impact Assessment Record

Scientific Name: *Tipuana tipu* (Benthe.) Kuntze

Common name: rosewood, tipuana tree

QUESTION	COMMENTS	RATING	CONFIDENCE
Social			
1. Restrict human access?	As a tree to 23m with a main trunk and elevated crown (Henderson, 2001), human access should not be impeded.	L	MH
2. Reduce tourism?	As a deciduous tree, invading creek banks and woodlands (CRC Weed Management, 2003) this plant would be obviously out of place to the average visitor, however it should not affect recreational use.	ML	M
3. Injurious to people?	No spines, burrs or toxicity noted in Henderson (2001).	L	MH
4. Damage to cultural sites?	This large tree (Henderson, 2001) has the potential to have a visual effect on cultural sites.	ML	MH
Abiotic			
5. Impact flow?	Invades riverbanks (Henderson, 2001), but not recorded in waterways and horticultural recommendations are for well-drained soil (Page & Olds, 1998 eds.) so unlikely to impact flow.	L	MH
6. Impact water quality?	This "large, massively branched deciduous tree" invades riverbanks (Henderson, 2001), and so has the potential to drop large amounts of leaf litter into waterways, which could lead to increased algal growth, with the potential to decrease light and oxygen levels in the water.	ML	MH
7. Increase soil erosion?	See q. 5. As it is not recorded in waterways it is unlikely to increase soil erosion. "It is used for...erosion control" (Cruz et al, 2002).	L	MH
8. Reduce biomass?	In the roadsides and riverbanks, savannahs (Henderson, 2001), woodland and open grassland areas that it invades (CRC Weed Management, 2003), this large tree (Henderson, 2001) is likely to increase carbon sequestering biomass.	L	MH
9. Change fire regime?	"It's ability to spread rapidly into woodlands, firebreaks, tracks, roadsides and other open areas has the potential to affect fire regimes" (CRC Weed Management, 2003). As a large plant it is likely to increase both the intensity and the frequency of fires in these landscapes, although the degree of change would depend on the infestation, so a medium value was chosen.	M	M
Community Habitat			
10. Impact on composition (a) high value EVC	Climate modelling shows that this species is not likely to occur as an invasive plant in Victoria.	L	H
(b) medium value EVC	Climate modelling shows that this species is not likely to occur as an invasive plant in Victoria.	L	H
(c) low value EVC	Climate modelling shows that this species is not likely to occur as an invasive plant in Victoria.	L	H
11. Impact on structure?	As a tree to 10m with a main trunk and elevated crown (CRC Weed Management, 2003), the plant is likely to compete for sunlight with small trees, tall and medium shrubs, grasses and groundcovers. In most of communities that it invades this would comprise most strata, but the degree of impact would depend on the	MH	MH

Impact Assessment Record

Scientific Name: *Tipuana tipu* (Benthe.) Kuntze

Common name: rosewood, tipuana tree

QUESTION	COMMENTS	RATING	CONFIDENCE
	level of infestation.		
12. Effect on threatened flora?	Climate modelling shows that this species is not likely to occur as an invasive plant in Victoria.	L	H
Fauna			
13. Effect on threatened fauna?	Climate modelling shows that this species is not likely to occur as an invasive plant in Victoria.	L	H
14. Effect on non-threatened fauna?	"Grows in woodland and open grassland areas" (CRC Weed Management, 2003). May reduce the available food for fauna that depend on ground-level vegetation. May be browsed by larger fauna.	ML	M
15. Benefits fauna?	"Since [native long-tailed pal-blue] butterflies are often seen round specimens of tipu tree...they probably breed on this too" (CaLM, 2005).	MH	MH
16. Injurious to fauna?	No spines, burrs or toxicity noted in Henderson (2001).	L	MH
Pest Animal			
17. Food source to pests?	As a tree (Henderson, 2001), provides little to no food for pest species.	L	MH
18. Provides harbor?	As a deciduous tree (Henderson, 2001), would provide little or no harbour to pest species.	L	MH
Agriculture			
19. Impact yield?	"Valued as a shade tree, a source of 'rosewood' timber and, in some circumstances, fodder for stock...It is popular in the Queensland pastoral industry for fattening stock during the winter period...cattle will eat new growth and thus kill rosewood seedlings." (CRC Weed Management, 2003). Soil improvement by rhizomatous roots and leaf litter improve the nutrient content and texture of soil "leading to increased pasture quality" (Cruz et al, 2002). Impact on yield likely to be positive rather than negative.	L	MH

Impact Assessment Record

Scientific Name: *Tipuana tipu* (Benth.) Kuntze

Common name: rosewood, tipuana tree

QUESTION	COMMENTS	RATING	CONFIDENCE
20. Impact quality?	See Q. 19, not likely to reduce the quality of stock nor to contaminate crop harvests.	L	MH
21. Affect land value?	See Q.19, no reason to reduce land value.	L	MH
22. Change land use?	See Q. 19, no reason to change land use.	L	MH
23. Increase harvest costs?	See Q. 19 no increase in harvest costs.	L	MH
24. Disease host/vector?	Not recorded as a host of agricultural disease.	L	L

References cited:

CRC Weed Management 2003, *Weed Management Guide- Rosewood or tipuana tree- Tipuana tipu*, CRC Weed Management, Australia.
 Cruz NT, Morales MU, Rjas E & Jøker D 2002, '*Tipuana tipu* (Benth.) Kuntze,' *Seed Leaflet* NO. 55, Danida Forest Seed Centre, Denmark.
 Henderson, L 2001, *Alien Weeds and Invasive Plants*, Agricultural Research Council, South Africa.
 Page, S & Olds, M (eds.) 1998, *Botanica*, Random House, Australia.

Date Revised by Revision

Invasiveness Assessment Record

Scientific name: *Trianoptiles solitaria* (C.B.Clarke) Levyns

Common Name: subterranean cape sedge

QUESTION	COMMENTS	RATING	CONFIDENCE
Establishment			
1. Germination requirements?	Leafy tufted annual, flowers in spring (Walsh & Entwistle 1994). Specific data on germination requirements lacking. Assume annual germination cycle due to seasonal conditions.	MH	MH
2. Establishment requirements?	In Koonung Creek, Balwyn, Victoria (the only known site where the plant has naturalised) it grows on a steep, grassed area. The grass (<i>Pennisetum clandestinum</i>) is dense and lush growth obscures the presence of <i>T. solitaria</i> (Hansford pers coms). In spite of this the herb persists. Likely to establish under moderate canopy or litter cover.	MH	M
3. How much disturbance is required?	When first found in Melbourne the site was considered degraded (Stajsic & Albrecht 1992). The infestation persists, but there is no evidence that it has spread into undisturbed areas or moved beyond the site (Hansford pers coms). Consider that some degree of disturbance may be required.	ML	MH
Growth/Competitive			
4. Life form?	Annual sedge from the Cyperaceae family. "...some of their fruits are formed and ripen underground; they are the "tubers" of the <i>Flora Capensis</i> ," (Riley 1963). Consider a geophyte.	ML	MH
5. Allelopathic properties?	None described	L	L
6. Tolerates herb pressure?	No data available	M	L
7. Normal growth rate?	No data available	M	L
8. Stress tolerance to frost, drought, w/logg, sal. etc?	Within its native range it is most commonly found in 'damp flats' (Bond & Goldblatt 1984). Response to stressors not documented.	L	L
Reproduction			
9. Reproductive system	Annual. Sexual reproduction only (Phillips 1951). No data on selfing, however, the plant produces both bisexual aerial and female basal spikelets. Assume the basal spikelets are fertile > clonal.	ML	MH
10. Number of propagules produced?	No data available. From figure in Stajsic & Albrecht (1992) assume <1000 propagules per plant.	ML	MH
11. Propagule longevity?	No data available	M	L
12. Reproductive period?	No data available	M	L
13. Time to reproductive maturity?	Small tufted annual (Phillips 1951). Reaches maturity in < one year.	H	MH
Dispersal			
14. Number of mechanisms?	"...there is undoubtedly [sic] great potential for the fruit to be dispersed [sic] beyond this site if attached to machinery or footwear," (Stajsic & Albrecht 1992) Such dispersal has not been	ML	MH

Invasiveness Assessment Record

Scientific name: *Trianoptiles solitaria* (C.B.Clarke) Levyns

Common Name: subterranean cape sedge

QUESTION	COMMENTS	RATING	CONFIDENCE
	demonstrated yet. The aerial fruits are described as ‘plumose’ (feather-like hairs branching from a central stem). Such fruits may attach to humans or animals.		
15. How far do they disperse?	No data available. Attached to humans or animals, possibly 200 metres, but potential much greater.	M	L

References cited:

Bond, P & Goldblatt, P 1984, ‘Plants of the Cape flora: A descriptive catalogue’, *Journal of South African botany*, suppl. vol. 13, p. 47

Phillips, PE 1951, *The genera of South African flowering plants*, 2nd ed, Union of South Africa, Pretoria

Riley, HP 1963, *Families of flowering plants of Southern Africa*, University of Kentucky Press

Stajsic, V & Albrecht, D 1992, ‘Two new introduced sedges (Cyperaceae) in Victoria’, *Indigenotes*, vol 5, no. 11 pp. 10-11

Walsh, NG & Entwistle, TJ, 1994, *Flora of Victoria: Ferns & allied plants, conifers & monocotyledons*, Inkata Press, Melbourne

Revisions

Date Revised by Revision

Present distribution of *Trianoptiles solitaria* in Victoria

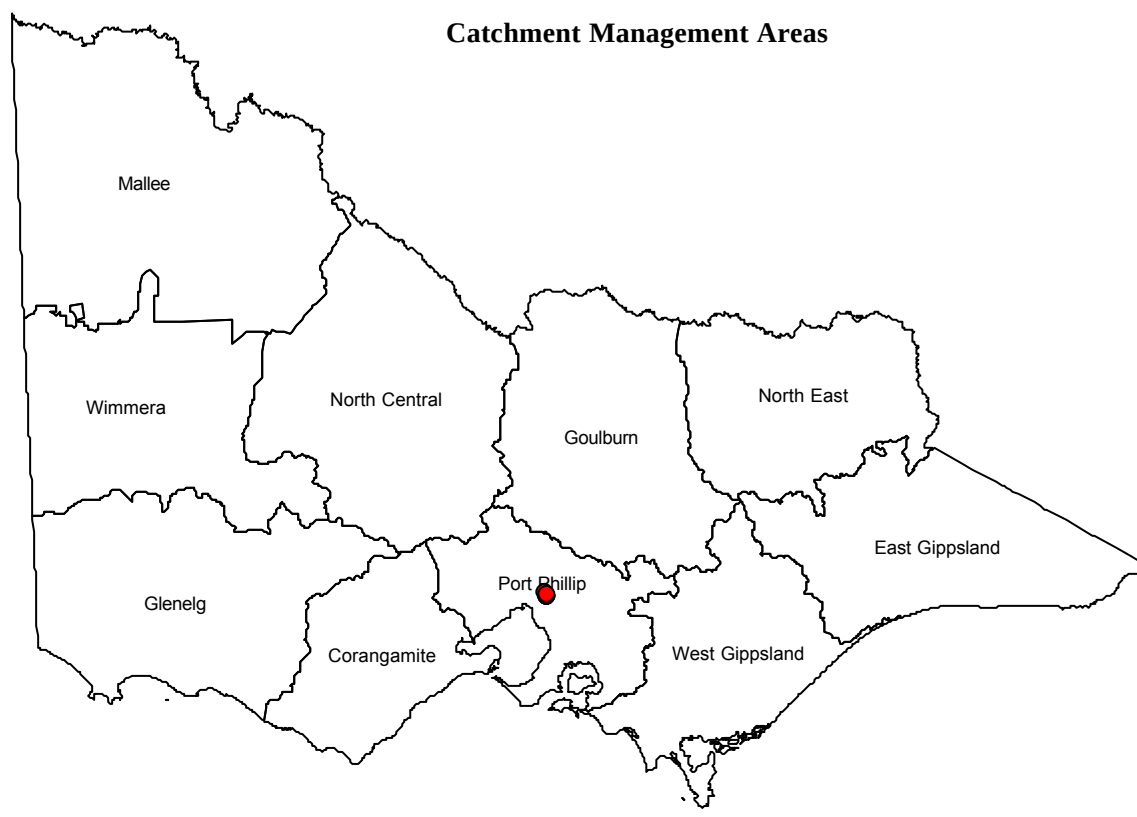
Scientific name: *Trianoptiles solitaria* (C.B. Clarke) Levyns

Common name(s): subterranean Cape sedge

Status: Not declared

Habitat:

A grass-like herb native to the Cape region of South Africa. It is more commonly found on damp flats (Bond & Goldblatt 1984), particularly from Maitland to Kenilworth east of Cape Town (Adamson & Salter 1950). Considered an occasional species. In Victoria it is known only in one location in a municipal reserve in Melbourne growing on a steep seasonally moist hill slope (Stajsic & Albrecht 1992).



Potential distribution of *Trianoptiles solitaria* in Victoria

Scientific name: *Trianoptiles solitaria* (C.B. Clarke) Levyns

Common name(s): subterranean Cape sedge

Status: Not declared

Habitat:

A grass-like herb native to the Cape region of South Africa. It is more commonly found on damp flats (Bond & Goldblatt 1984), particularly from Maitland to Kenilworth east of Cape Town (Adamson & Salter 1950). Considered an occasional species. In Victoria it is known only in one location in a municipal reserve in Melbourne growing on a steep seasonally moist hill slope (Stajsic & Albrecht 1992).

Potential distribution produced from CLIMATE modelling refined by applying suitable landuse and vegetation type overlays with CMA boundaries

MAP OVERLAYS USED.

Land Use:

Irrigated pasture

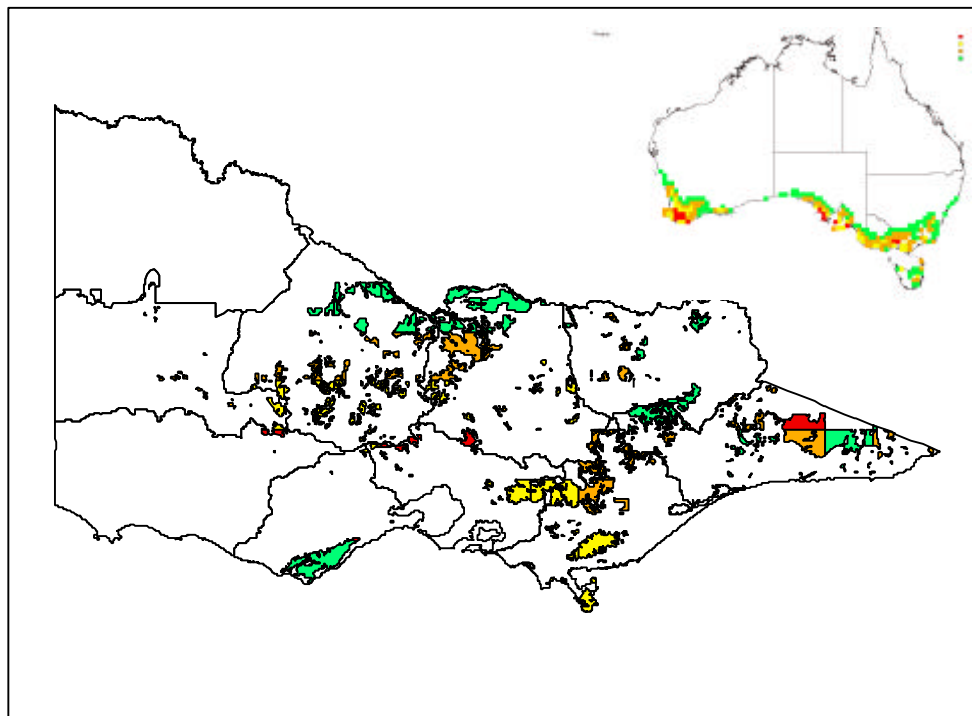
Broad vegetation types

Swamp scrub; Sedge-rich woodland; Moist foothill forest; Riverine grassy woodland; Riparian forest

Colours indicate possibility of *Trianoptiles solitaria* infesting these areas.

Red	= Very high	Yellow	= High
Orange	= Medium	Green	= Likely

In the non-coloured areas the plant is unlikely to establish as the climate, soil or landuse is not presently suitable.



Impact Assessment Record

Scientific Name: *Trianoptiles solitaria* (C.B. Clarke) Levyns

Common name: subterranean Cape sedge

QUESTION	COMMENTS	RATING	CONFIDENCE
Social			
1. Restrict human access?	Leafy tufted annual to c. 20cm high (Stajsic & Albrecht 1992). Would not restrict human access.	L	MH
2. Reduce tourism?	Low growing species. Hansford (pers coms) had difficulty locating the plant in amongst the taller growing grasses. Unlikely to affect tourism; weed not obvious.	L	M
3. Injurious to people?	No toxic or harmful properties described. Leaves are described as smooth to touch (Stajsic & Albrecht 1992).	L	MH
4. Damage to cultural sites?	A low growing annual sedge. The infestation in Melbourne is described as, "...locally abundant over an area of about 0.1 ha," (Stajsic & Albrecht 1992). Particularly dense infestations may produce a moderately negative visual effect at certain times of year, but would also depend upon the form of other coexisting species.	L	MH
Abiotic			
5. Impact flow?	Within its native range it inhabits, "[d]amp places on the flats from Maitland to Kenilworth," (Adamson & Salter 1950). Not occurring in-stream; does not affect water flow.	L	MH
6. Impact water quality?	See comment in q5 above.	L	MH
7. Increase soil erosion?	A low growing annual species, which germinates in June and dies off in January (CRC 2003). Where it occurs in the northeast of Melbourne it coexists with a range of native and exotic grasses and sedges, and while it is recorded as being abundant in a small area of 0.1 ha (Stajsic & Albrecht 1992), it is not noted as a dominant species. As it occurs in seasonally moist or boggy areas it may contribute to soil erosion if it were to exist as the dominant species and leave areas of soil exposed to heavy rainfall or flooding.	ML	MH
8. Reduce biomass?	Low growing annual. May displace some annual grasses. Little or no change to biomass.	ML	L
9. Change fire regime?	In Melbourne as in its native range (Stajsic & Albrecht 1992, Bond & Goldblatt 1984), found in moist areas, which are unlikely to be fire prone or support hot fires. Low growing sedge, would produce little fuel to establish or support fire. No change to fire risk.	L	MH
Community Habitat			
10. Impact on composition (a) high value EVC	EVC=Swampy riparian woodland (E); CMA=East Gippsland; Bioreg=East Gippsland Uplands; Climate=VH. The current infestation in Melbourne, Victoria, which has been present for over 12 years (Stajsic & Albrecht 1992) does not appear to be affecting what is already a highly disturbed area (public reserve). The grassland area it infests is mown regularly (Hansford, pers coms), yet the plant persists. In a natural ecosystem it may eventually establish a more dense population perhaps minimally displacing a dominant or indicator species in the lower stratum. Minor impact on the lowest layer	ML	M
(b) medium value EVC	EVC=Swampy riparian woodland (D); CMA=Port Phillip; Bioreg=Highlands Southern Fall; H CLIMATE potential. See comment in q10(a) above. Impact may be reduced due to High CLIMATE match only.	ML	M

Impact Assessment Record

Scientific Name: *Trianoptiles solitaria* (C.B. Clarke) Levyns

Common name: subterranean Cape sedge

QUESTION	COMMENTS	RATING	CONFIDENCE
(c) low value EVC	EVC=Riparian forest (D); CMA=Port Phillip; Bioreg=Highlands Southern Fall; H CLIMATE potential. See comment in q10(a) above. It appears to tolerate a high level of shading (see Invasiveness assessment) and would possibly establish and survive in more open riparian forest areas. Impact may be reduced due to High CLIMATE match only.	ML	M
11. Impact on structure?	The current infestation in Melbourne, Victoria, which has been present for over 12 years (Stajsic & Albrecht 1992) does not appear to be affecting what is already a highly disturbed area (public reserve). The grassland area it infests is mown regularly (Hansford, pers coms), yet the plant persists. It may displace some annual grasses or forbs. Minor impact on the lowest layer	L	M
12. Effect on threatened flora?	No data documented	MH	L
Fauna			
13. Effect on threatened fauna?	No data documented	MH	L
14. Effect on non-threatened fauna?	No data documented	M	L
15. Benefits fauna?	Palatability of species not documented. Assume provides little or no support for fauna.	H	L
16. Injurious to fauna?	No harmful properties described. No thorns or prickles.	L	L
Pest Animal			
17. Food source to pests?	Palatability of species not documented. Assume provides little or no support for pest animals.	L	L
18. Provides harbor?	Small leafy annual herb (CRC 2003). Not likely to provide harbour for pest species.	L	M
Agriculture			
19. Impact yield?	Not known anywhere as a weed of agriculture. Consider minimal affect.	L	L

Impact Assessment Record

Scientific Name: *Trianoptiles solitaria* (C.B. Clarke) Levyns

Common name: subterranean Cape sedge

QUESTION	COMMENTS	RATING	CONFIDENCE
20. Impact quality?	Not known anywhere as a weed of agriculture. Consider minimal affect.	L	L
21. Affect land value?	No	L	L
22. Change land use?	No	L	L
23. Increase harvest costs?	No	L	L
24. Disease host/vector?	No documented evidence of this species being a host or vector for disease of agriculture.	L	L

References cited:

Adamson, RS & Salter, TM 1950, *Flora of the Cape peninsula*, Juta & Co. Ltd, Cape Town and Johannesburg

Bond, P & Goldblatt, P 1984, 'Plants of the Cape flora: A descriptive catalogue', *Journal of South African botany*, suppl. vol. 13, p. 47

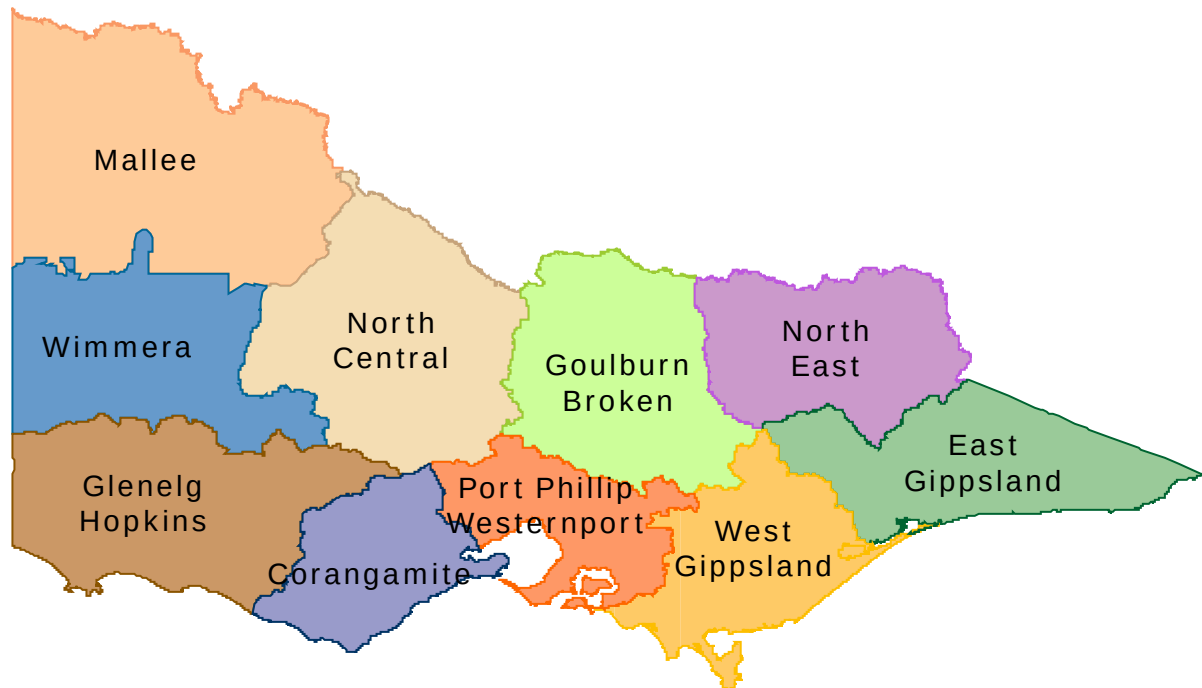
CRC Weed Management, 2003, Weed management guide: subterranean Cape sedge (*Trianoptiles solitaria*), CRC for Australian Weed Management and Commonwealth Department of the Environment and Heritage

Stajsic, V & Albrecht, D 1992, 'Two new introduced sedges (Cyperaceae) in Victoria', *Indigenotes*, vol 5, no. 11 pp. 10-11

Revisions

Date	Revised by	Revision

Noxious Weeds Review Phase 3a
Scores and rank by CMA Region



Noxious Weeds Review; Phase 3a species
Corangamite CMA
Regional score and rank

Scientific name	Common name	Inv. Score	Regional dist.	Impact Score	Regional score	Regional rank	Rank Relative to Phases 1&2
<i>Acacia catechu</i>	Cutch tree	0.6061	1.00	0.1080	0.4732	56	140
<i>Acacia nilotica</i>	Prickly acacia	0.5744	1.00	0.5345	0.7082	5	6
<i>Ambrosia artemisiifolia</i>	Annual ragweed	0.5760	0.85	0.2849	0.5177	43	101
<i>Ambrosia confertiflora</i>	Burr ragweed	0.5941	0.85	0.2267	0.4872	54	132
<i>Ambrosia tenuifolia</i>	Lacy ragweed	0.6041	0.85	0.1411	0.4405	64	158
<i>Annona glabra</i>	Pond apple	0.6948	1.00	0.2587	0.5682	31	58
<i>Anredera cordifolia</i>	Madeira vine	0.7660	0.85	0.3585	0.5817	27	51
<i>Asystasia gangetica</i> ssp. <i>micrantha</i>	Chinese violet	0.5931	0.71	0.2305	0.4417	63	157
<i>Barleria prionitis</i>	Barleria, porcupine flower	0.7002	1.00	0.1502	0.5081	48	111
<i>Bassia scoparia</i>	Kochia	0.6106	0.85	0.3563	0.5618	33	63
<i>Cabomba caroliniana</i>	Cabomba	0.6202	0.85	0.4813	0.6330	16	33
<i>Calluna vulgaris</i>	Heather	0.6742	0.85	0.2891	0.5318	38	89
<i>Calystegia silvatica</i>	Greater bindweed	0.3180	0.85	0.2593	0.4724	58	142
<i>Carthamus glaucus</i>	Glaucous star thistle	0.5168	0.85	0.3251	0.5331	37	88
<i>Centaurea maculosa</i>	Spotted knapweed	0.7544	0.85	0.5016	0.6604	13	23
<i>Chromolaena odorata</i>	Siam weed, chromolaena	0.7892	1.00	0.4469	0.6850	9	18
<i>Cryptostegia grandiflora</i>	Rubber vine	0.7574	1.00	0.4880	0.7042	6	7
<i>Cynoglossum creticum</i>	Blue hound's tongue	0.5987	1.00	0.2110	0.5300	39	92
<i>Cyperus teneristolon</i>	Cyperus	0.7330	0.57	0.2058	0.3970	65	170
<i>Disa bracteata</i>	African weed-orchid	0.7635	0.71	0.2567	0.4768	55	137
<i>Dittrichia viscosa</i>	False yellowhead	0.6756	0.85	0.2327	0.5004	51	118
<i>Gymnocoronis spilanthoides</i>	Senegal tea plant	0.4856	0.71	0.3575	0.4999	52	119
<i>Hedera helix</i>	English ivy	0.7455	0.42	0.3875	0.4493	62	154
<i>Hymenachne amplexicaulis</i>	Hymenachne, Olive hymenachne	0.6675	1.00	0.6456	0.7816	2	2
<i>Hypericum calycinum</i>	Large flowered St John's wort	0.5533	0.85	0.3388	0.5451	35	78
<i>Hypericum canariense</i>	Canary Island St John's wort	0.5055	0.85	0.2873	0.5106	46	107
<i>Hypericum humifusum</i>	Trailing St John's wort	0.4552	1.00	0.2088	0.5116	45	105
<i>Koeleruteria elegans</i> ssp. <i>formosana</i>	Chinese rain tree	0.5911	1.00	0.1677	0.5048	49	113
<i>Lachenalia reflexa</i>	Yellow Soldier	0.4270	0.85	0.3116	0.5147	44	103
<i>Lantana camara</i>	Lantana	0.6496	0.57	0.6372	0.6286	17	34
<i>Miconia</i> spp.	Miconia	0.8664	1.00	0.3037	0.6140	21	39
<i>Mimosa pigra</i>	Mimosa, giant sensitive plant	0.8180	1.00	0.3506	0.6345	15	31
<i>Onopordum dissectum</i>	Thistle	0.4312	1.00	0.3832	0.6063	25	44
<i>Onopordum nervosum</i>	Cotton thistle	0.5962	1.00	0.4685	0.6739	12	21
<i>Onopordum tauricum</i>	Taurian thistle	0.4682	0.85	0.3464	0.5392	36	82
<i>Opuntia aurantiaca</i>	Tiger pear	0.6516	0.85	0.6580	0.7357	3	3
<i>Parkinsonia aculeata</i>	Parkinsonia	0.6416	1.00	0.5568	0.7288	4	4
<i>Pelargonium alchemilloides</i>	Garden geranium	0.6058	1.00	0.3686	0.6191	20	38
<i>Pereskia aculeata</i>	Leaf cactus	0.7889	1.00	0.7331	0.8452	1	1
<i>Piptochaetium montevidense</i>	Uruguayan rice grass	0.7066	0.85	0.3544	0.5723	30	55
<i>Praxelis clematidea</i>	Praxelis	0.7051	1.00	0.3349	0.6121	22	40
<i>Retama raetam</i>	White weeping broom	0.6883	0.85	0.5053	0.6546	14	24
<i>Rubus alceifolius</i>	Giant bramble	0.6207	1.00	0.1977	0.5252	41	97
<i>Rubus argutus</i>	Florida blackberry	0.8084	1.00	0.4430	0.6851	8	17
<i>Rubus rugosus</i>	Keriberry	0.6752	0.85	0.4284	0.6100	23	41
<i>Sagittaria montevidensis</i>	Arrowhead	0.6835	0.71	0.4546	0.5780	28	52
<i>Sagittaria platyphylla</i>	Delta arrowhead	0.6835	0.71	0.4546	0.5780	28	52
<i>Sagittaria pygmaea</i>	Dwarf arrowhead	0.6835	1.00	0.4546	0.6766	11	20
<i>Salix alba</i>	Willows	0.5995	0.42	0.5951	0.5480	34	77
<i>Salix cinerea</i>	Willows	0.9190	0.57	0.6668	0.6775	10	19
<i>Salix fragilis</i>	Willows	0.5141	0.57	0.6283	0.6073	24	42
<i>Salix humboltiana</i>	Willows	0.5007	0.71	0.3397	0.4917	53	126
<i>Salix matsudana</i>	Willows	0.5980	0.57	0.3534	0.4634	60	148
<i>Salix nigra</i>	Willows	0.5656	0.71	0.5594	0.6225	19	37
<i>Salix purpurea</i>	Willows	0.7995	0.71	0.6302	0.6902	7	14
<i>Salix viminalis</i>	Willows	0.5605	0.71	0.4960	0.5864	26	50
<i>Salix x pendulina</i>	Willows	0.5864	0.71	0.2763	0.4665	59	147
<i>Salix x rubens</i>	Willows	0.6057	0.42	0.6283	0.5673	32	59
<i>Salix x sepulcralis</i> ¹	Willows	0.5920	0.71	0.3534	0.5103	47	108

Noxious Weeds Review; Phase 3a species
Corangamite CMA
Regional score and rank

Scientific name	Common name	Inv. Score	Regional dist.	Impact Score	Regional score	Regional rank	Rank Relative to Phases 1&2
<i>Scolymus maculatus</i>	Spotted thistle	0.7940	0.85	0.2136	0.5039	50	114
<i>Senecio glastifolius</i>	Holly leaved senecio	0.5973	0.85	0.3018	0.5297	40	93
<i>Tamarix aphylla</i>	Athel pine, tamarisk	0.6738	0.71	0.3558	0.5215	42	98
<i>Thunbergia laurifolia</i>	Laurel clock vine	0.4405	1.00	0.4150	0.6253	18	36
<i>Tipuana tipu</i>	Rosewood, tipuana tree	0.4541	1.00	0.1403	0.4731	57	141
<i>Trianoptiles solitaria</i>	Subterranean Cape sedge	0.5107	0.85	0.1887	0.4559	61	150

* includes *S. x chrysocoma*



Noxious Weeds Review; Phase 3a species

Corangamite CMA

Phase 3a Species: Ranked order relative to Phase 1 & 2 Review (highlighted in red)

Scientific name	common name	Invasiveness Score	Regional Dist	Impact Scores	Final Score	RANK
<i>Pereskia aculeata</i>	Leaf cactus	0.788886	1.00	0.733119	0.845213	1
<i>Hymenachne amplexicaulis</i>	Hymenachne, Olive hymenachne	0.667534	1.00	0.645600	0.781640	2
<i>Opuntia aurantiaca</i>	Tiger pear	0.651556	0.85	0.657976	0.735653	3
<i>Parkinsonia aculeata</i>	Parkinsonia	0.641562	1.00	0.556809	0.728801	4
<i>Eichhornia crassipes</i>	Water Hyacinth	0.879335	1	0.527622	0.720989	5
<i>Acacia nilotica</i>	Prickly acacia	0.574417	1.00	0.534471	0.708234	6
<i>Cryptostegia grandiflora</i>	Rubber vine	0.757375	1.00	0.488003	0.704167	7
<i>Orobanche ramosa</i>	Branched Broomrape	0.769900	1	0.519638	0.703385	8
<i>Pennisetum macrourum</i>	African Feather Grass	0.612026	0.85	0.627185	0.696667	9
<i>Acacia erioloba</i>	Giraffe thorn	0.700000	1	0.519638	0.694997	10
<i>Hieracium spp.</i>	Hawkweeds	0.700000	1	0.519638	0.694997	10
<i>Nassella tenuissima</i>	Mexican feather grass	0.700000	1	0.519638	0.694997	10
<i>Acacia karroo</i>	Karoo thorn	0.670000	1	0.519638	0.691397	13
<i>Salix purpurea</i>	Willows	0.799511	0.71	0.630180	0.690242	14
<i>Nassella charruana</i>	Lobed needle grass	0.650000	1	0.519638	0.688997	15
<i>Salvinia molesta</i>	Salvinia	0.587464	1	0.529090	0.686786	16
<i>Rubus argutus</i>	Florida blackberry	0.808417	1.00	0.442982	0.685080	17
<i>Chromolaena odorata</i>	Siam weed, chromolaena	0.789234	1.00	0.446929	0.684988	18
<i>Salix cinerea</i>	Willows	0.919002	0.57	0.666778	0.677476	19
<i>Sagittaria pygmaea</i>	Dwarf arrowhead	0.683469	1.00	0.454599	0.676592	20
<i>Onopordum nervosum</i>	Cotton thistle	0.596175	1.00	0.468505	0.673904	21
<i>Fallopia japonica</i> , <i>Fallopia sachalinensi</i>	Japanese and Giant knotweed	0.506400	1	0.519638	0.671765	22
<i>Centaurea maculosa</i>	Spotted knapweed	0.754357	0.85	0.501646	0.660445	23
<i>Retama raetam</i>	White weeping broom	0.688328	0.85	0.505316	0.654576	24
<i>Parthenium hysterophorus</i>	Parthenium Weed	0.825166	1	0.420087	0.654269	25
<i>Nassella trichotoma</i>	Serrated Tussock	0.761536	0.57	0.675277	0.651939	26
<i>Equisetum spp.</i>	Horsetails	0.726000	0.85	0.519638	0.650117	27
<i>Alternanthera philoxeroides</i>	Alligator Weed	0.527352	0.57	0.719621	0.648670	28
<i>Prosopis spp.</i>	Mesquite	0.658431	0.85	0.521093	0.642824	29
<i>Iva axillaris</i>	Poverty Weed	0.538501	1	0.453036	0.638320	30
<i>Mimosa pigra</i>	Mimosa, giant sensitive plant	0.818008	1.00	0.350578	0.634484	31
<i>Rubus fruticosus</i> agg.	Blackberry	0.767146	0.42	0.726464	0.633277	32
<i>Cabomba caroliniana</i>	Cabomba	0.620155	0.85	0.481313	0.632954	33
<i>Lantana camara</i>	Lantana	0.649647	0.57	0.637247	0.628616	34
<i>Xanthium spinosum</i>	Noogoora Burr/ Californian Burr	0.619536	0.85	0.500315	0.626521	35
<i>Thunbergia laurifolia</i>	Laurel clock vine	0.440524	1.00	0.415005	0.625266	36
<i>Salix nigra</i>	Willows	0.565578	0.71	0.559364	0.622513	37
<i>Pelargonium alchemilloides</i>	Garden geranium	0.605828	1.00	0.368643	0.619139	38
<i>Miconia spp.</i>	Miconia	0.866385	1.00	0.303706	0.614041	39
<i>Praxelis clematidea</i>	Praxelis	0.705095	1.00	0.334863	0.612135	40
<i>Rubus rugosus</i>	Keriberry	0.675226	0.85	0.428443	0.609955	41
<i>Salix fragilis</i>	Willows	0.514090	0.57	0.628311	0.607345	42
<i>Convolvulus arvensis</i>	Bindweed	0.779101	0.85	0.430366	0.606497	43
<i>Onopordum dissectum</i>	Thistle	0.431190	1.00	0.383170	0.606318	44
<i>Echium vulgare</i>	Viper's Bugloss	0.655865	0.85	0.446556	0.600775	45
<i>Lagarosiphon major</i>	Lagarosiphon	0.649037	1	0.342517	0.589694	46
<i>Hemeria flaccida</i>	Cape Tulip (two-leaf)	0.684162	0.85	0.417379	0.587832	47
<i>Centaurea solstitialis</i>	St. Barnaby's Thistle	0.655091	0.85	0.423400	0.587715	48
<i>Ulex europaeus</i>	Furze/Gorse	0.828248	0.57	0.545087	0.587038	49
<i>Salix viminalis</i>	Willows	0.560486	0.71	0.495981	0.586408	50
<i>Anredera cordifolia</i>	Madeira vine	0.766046	0.85	0.358456	0.581661	51
<i>Sagittaria montevidensis</i>	Arrowhead	0.683469	0.71	0.454599	0.577992	52
<i>Sagittaria platyphylla</i>	Delta arrowhead	0.683469	0.71	0.454599	0.577992	52
<i>Acroptilon repens</i>	Hardheads/Russian Knapweed	0.514006	0.85	0.434553	0.577030	54
<i>Piptochaetium montevidense</i>	Uruguayan rice grass	0.706617	0.85	0.354400	0.572258	55
<i>Nassella neesiana</i>	Chilean needle grass	0.686622	0.57	0.543816	0.569332	56
<i>Cirsium arvense</i>	Californian/Perennial Thistle	0.702729	0.71	0.458673	0.568385	57
<i>Annona glabra</i>	Pond apple	0.694802	1.00	0.258663	0.568228	58
<i>Salix x rubens</i>	Willows	0.605670	0.42	0.628311	0.567335	59
<i>Hemeria miniata</i>	Cape Tulip (one-leaf)	0.747658	0.71	0.440860	0.563800	60
<i>Rosa rubiginosa</i>	Sweet Briar	0.793721	0.57	0.508953	0.562660	61
<i>Cytisus scoparius</i>	English Broom	0.734874	0.57	0.520938	0.562310	62
<i>Bassia scoparia</i>	Kochia	0.610614	0.85	0.356267	0.561783	63
<i>Onopordum illyricum</i>	Illyrian Thistle	0.533147	0.85	0.401999	0.561097	64
<i>Datura ferox</i>	Thorn Apple (common)	0.703633	0.71	0.444751	0.560697	65
<i>Datura stramonium</i>	Thorn Apple (longspine)	0.703600	0.71	0.444751	0.560693	66
<i>Datura innoxia</i>	Thorn Apple (recurved)	0.703600	0.71	0.444751	0.560693	66
<i>Alhagi maurorum</i>	Camelthorn	0.569959	0.85	0.386286	0.556715	68

Noxious Weeds Review; Phase 3a species

Corangamite CMA

Phase 3a Species: Ranked order relative to Phase 1 & 2 Review (highlighted in red)

Scientific name	common name	Invasiveness Score	Regional Dist	Impact Scores	Final Score	RANK
<i>Cuscuta</i> spp.	Dodder	0.734033	0.71	0.429397	0.555746	69
<i>Hypericum triquetrifolium</i>	Tangled Hypericum	0.602251	0.85	0.377231	0.555520	70
<i>Cannabis sativa</i>	Marijuana	0.565385	1	0.297461	0.554424	71
<i>Onopordum acanthium</i>	Scotch/Heraldic Thistle	0.571238	0.85	0.381627	0.554260	72
<i>Allium triquetrum</i>	Angled Onion	0.614461	0.71	0.448094	0.551868	73
<i>Tribulus terrestris</i>	Caltrop	0.606654	0.85	0.368584	0.551205	74
<i>Festuca gautieri</i>	bearskin fescue	0.491440	0.85	0.387816	0.548150	75
<i>Amsinckia</i> spp.	Amsinckia	0.745464	0.85	0.333240	0.548070	76
<i>Salix alba</i>	Willows	0.599482	0.42	0.595056	0.547969	77
<i>Hypericum calycinum</i>	Large flowered St John's wort	0.553290	0.85	0.338782	0.545113	78
<i>Salpichroa origanifolia</i>	Pampas Lily-of-the-Valley	0.762638	0.85	0.320066	0.542753	79
<i>Opuntia robusta</i>	Wheel Cactus	0.645158	0.85	0.345016	0.542628	80
<i>Senecio pterophorus</i>	African Daisy	0.676556	0.85	0.337358	0.542107	81
<i>Onopordum tauricum</i>	Taurian thistle	0.468246	0.85	0.346370	0.539157	82
<i>Chondrilla juncea</i>	Skeleton Weed	0.742382	0.85	0.315662	0.537856	83
<i>Ailanthus altissima</i>	Tree of Heaven	0.895314	0.57	0.441183	0.536900	84
<i>Cardaria draba</i>	Hoary Cress	0.563497	0.71	0.429138	0.535137	85
<i>Ambrosia psilostachya</i>	Perennial Ragweed	0.489293	0.85	0.364356	0.534755	86
<i>Eragrostis curvula</i>	African Lovegrass	0.715330	0.85	0.314456	0.533935	87
<i>Carthamus glaucus</i>	Glaucous star thistle	0.516750	0.85	0.325102	0.533067	88
<i>Calluna vulgaris</i>	Heather	0.674172	0.85	0.289081	0.531786	89
<i>Opuntia stricta</i>	Prickly Pear (drooping)	0.552003	0.85	0.345016	0.531449	90
<i>Lavandula stoechas</i>	Topped Lavender	0.682210	0.85	0.316423	0.531062	91
<i>Cynoglossum creticum</i>	Blue hound's tongue	0.598661	1.00	0.210974	0.529985	92
<i>Senecio glastifolius</i>	Holly leaved senecio	0.597307	0.85	0.301771	0.529669	93
<i>Marrubium vulgare</i>	Horehound	0.771737	0.57	0.451853	0.528046	94
<i>Lycium ferocissimum</i>	Boxthorn	0.674957	0.57	0.470710	0.526993	95
<i>Centaurea nigra</i>	Black Knapweed	0.641607	0.85	0.317275	0.526667	96
<i>Rubus alceifolius</i>	Giant bramble	0.620743	1.00	0.197677	0.525188	97
<i>Tamarix aphylla</i>	Athel pine, tamarisk	0.673811	0.71	0.355786	0.521497	98
<i>Alternanthera pungens</i>	Khaki Weed	0.653479	0.85	0.303604	0.520436	99
<i>Cytisus multiflorus</i>	white Spanish broom	0.517034	0.85	0.330775	0.519278	100
<i>Ambrosia artemisiifolia</i>	Ragweeds annual	0.575985	0.85	0.284903	0.517664	101
<i>Cestrum parqui</i>	Chilean Cestrum	0.727801	0.71	0.358471	0.515280	102
<i>Lachenalia reflexa</i>	Yellow Soldier	0.426976	0.85	0.311622	0.514746	103
<i>Conium maculatum</i>	Hemlock	0.665290	0.57	0.446703	0.512388	104
<i>Hypericum humifusum</i>	Trailing St John's wort	0.455230	1.00	0.208817	0.511565	105
<i>Opuntia vulgaris</i>	Prickly Pear (erect)	0.759228	0.71	0.345016	0.511516	106
<i>Hypericum canariense</i>	Canary Island St John's wort	0.505525	0.85	0.287333	0.510570	107
<i>Salix x sepulcralis</i>¹	Willows	0.592031	0.71	0.353359	0.510325	108
<i>Sagittaria graminea</i>	Arrowhead	0.586551	0.85	0.298489	0.509540	109
<i>Sida leprosa</i>	Ivy-leaved Sida	0.485639	1	0.234041	0.509339	110
<i>Barleria prionitis</i>	Barleria, porcupine flower	0.700199	1.00	0.150169	0.508118	111
<i>Solanum elaeagnifolium</i>	Silverleaf Nightshade	0.667968	0.71	0.357925	0.507794	112
<i>Koeleruteria elegans ssp.formosa</i>	Chinese rain tree	0.591073	1.00	0.167702	0.504842	113
<i>Scolymus maculatus</i>	Spotted thistle	0.794014	0.85	0.213592	0.503893	114
<i>Calicotome spinosa</i>	Spiny Broom	0.447135	0.85	0.317558	0.503489	115
<i>Crataegus monogyna</i>	Hawthorn	0.704590	0.42	0.506902	0.502816	116
<i>Spartium junceum</i>	Spanish broom	0.341815	0.85	0.33587	0.501105	117
<i>Dittrichia viscosa</i>	False yellowhead	0.675616	0.85	0.232653	0.500360	118
<i>Gymnocoronis spilanthoides</i>	Senegal tea plant	0.485586	0.71	0.357542	0.499894	119
<i>Scolymus hispanicus</i>	Golden Thistle	0.497723	0.71	0.377717	0.498448	120
<i>Hypericum tetrapterum</i>	St. Peter's Wort	0.552896	0.85	0.284303	0.497557	121
<i>Cenchrus longispinus</i>	Spiny Burr Grass/ Gentle Annie	0.402417	0.85	0.313125	0.495640	122
<i>Onopordum acaulon</i>	Stemless Thistle	0.528267	0.85	0.285015	0.495001	123
<i>Cynara cardunculus</i>	Artichoke Thistle	0.662745	0.57	0.413264	0.493358	124
<i>Echium plantagineum</i>	Paterson's Curse	0.665066	0.57	0.412722	0.493332	125
<i>Salix humboldtiana</i>	Willows	0.500663	0.71	0.339666	0.491693	126
<i>Silybum marianum</i>	Variegated Thistle	0.765111	0.57	0.387726	0.491340	127
<i>Centaurea calcitrapa</i>	Star Thistle	0.408196	0.85	0.303943	0.491192	128
<i>Juncus acutus</i>	Spiny Rush	0.516930	0.57	0.438554	0.490022	129
<i>Carduus nutans</i>	Nodding Thistle	0.390918	0.85	0.302426	0.488269	130
<i>Physalis viscosa</i>	Prairie Ground Cherry	0.727781	0.71	0.309365	0.487778	131
<i>Ambrosia confertiflora</i>	Burr ragweed	0.594088	0.85	0.226697	0.487241	132
<i>Genista linifolia</i>	Flax Leaved Broom	0.703726	0.57	0.392163	0.486458	133
<i>Nassella hyalina</i>	cane needle grass	0.503576	0.85	0.267807	0.482401	134
<i>Ibicella lutea</i>	Devil's Claw (yellowflower)	0.616016	0.85	0.241384	0.481097	135
<i>Asparagus asparagoides</i>	bridal creeper	0.782848	0.57	0.361907	0.479010	136

Noxious Weeds Review; Phase 3a species

Corangamite CMA

Phase 3a Species: Ranked order relative to Phase 1 & 2 Review (highlighted in red)

Scientific name	common name	Invasiveness Score	Regional Dist	Impact Scores	Final Score	RANK
<i>Disa bracteata</i>	African weed-orchid	0.763497	0.71	0.256714	0.476779	137
<i>Emex australis</i>	Spiny Emex	0.535113	0.85	0.247396	0.474755	138
<i>Cirsium acarna</i>	Soldier Thistle	0.523968	0.85	0.249563	0.474632	139
<i>Acacia catechu</i>	Cutch tree	0.606058	1.00	0.107969	0.473190	140
<i>Tipuana tipu</i>	Rosewood, tipuana tree	0.454073	1.00	0.140342	0.473080	141
<i>Calystegia silvatica</i>	Greater bindweed	0.317991	0.85	0.259324	0.472380	142
<i>Proboscidea louisianica</i>	Devil's Claw (purpleflower)	0.542172	0.85	0.241384	0.472236	143
<i>Hypericum androsaemum</i>	Tutsan	0.746650	0.71	0.276452	0.471611	144
<i>Solanum rostratum</i>	Buffalo Burr	0.468698	0.85	0.254399	0.470707	145
<i>Carthamus lanatus</i>	Saffron Thistle	0.499430	0.57	0.405518	0.469422	146
<i>Salix x pendulina</i>	Willows	0.586438	0.71	0.276310	0.466506	147
<i>Salix matsudana</i>	Willows	0.598025	0.57	0.353359	0.463444	148
<i>Carduus tenuiflorus</i> / <i>C. pycnocephalus</i>	Slender/Shore Thistle	0.608219	0.57	0.359060	0.456460	149
<i>Trianoptiles solitaria</i>	Subterranean Cape sedge	0.510665	0.85	0.188664	0.455932	150
<i>Pittosporum undulatum</i>	sweet pittosporum	0.793704	0.57	0.315117	0.454110	151
<i>Genista monspessulana</i>	Cape Broom /Montpellier Broom	0.698418	0.42	0.419839	0.453320	152
<i>Xanthium strumarium</i>	Bathurst Burr	0.585163	0.57	0.356250	0.452120	153
<i>Hedera helix</i>	English ivy	0.745474	0.42	0.387495	0.449254	154
<i>Hypericum perforatum</i>	St. John's Wort	0.660601	0.57	0.334271	0.448864	155
<i>Leucanthemum vulgare</i>	Ox-eye Daisy	0.610238	0.57	0.333108	0.442169	156
<i>Asystasia gangetica</i> ssp. <i>micrantha</i>	Chinese violet	0.593129	0.71	0.230522	0.441668	157
<i>Ambrosia tenuifolia</i>	Lacy ragweed	0.604084	0.85	0.141134	0.440525	158
<i>Chrysanthemoides monilifera</i>	Boneseed/Bitou Bush	0.799614	0.42	0.375091	0.440405	159
<i>Nassella leucotricha</i>	Texas needle grass	0.627929	0.57	0.326146	0.440393	160
<i>Dittrichia graveolens</i>	Stinkwort	0.607585	0.57	0.319717	0.434352	161
<i>Senecio jacobaea</i>	Ragwort	0.776347	0.42	0.363784	0.431281	162
<i>Vinca major</i>	blue periwinkle	0.703021	0.57	0.289181	0.428704	163
<i>Dipsacus fullonum</i>	Wild Teasel	0.551563	0.57	0.309552	0.421937	164
<i>Allium vineale</i>	Wild Garlic	0.658241	0.57	0.285822	0.421449	165
<i>Melianthus comosus</i>	Tufted Honeyflower	0.492463	0.42	0.394016	0.414144	166
<i>Solanum linnaeanum</i>	Apple of Sodom	0.356227	0.57	0.325025	0.407161	167
<i>Verbascum thapsus</i>	Great Mullein	0.474171	0.57	0.296038	0.405082	168
<i>Watsonia meriana</i> 'Bulbillifera'	Wild Watsonia	0.402004	0.57	0.307647	0.402923	169
<i>Cyperus teneristolon</i>	Cyperus	0.732975	0.57	0.205759	0.396982	170
<i>Foeniculum vulgare</i>	Fennel	0.574220	0.42	0.326980	0.386415	171
<i>Oxalis pes-caprae</i>	Soursob	0.743995	0.28	0.365451	0.383532	172
<i>Asphodelus fistulosus</i>	Onion Weed	0.539790	0.42	0.328848	0.383330	173
<i>Diplotaxis tenuifolia</i>	Sand Rocket/Sand Mustard	0.565974	0.42	0.317803	0.380286	174
<i>Cirsium vulgare</i>	Spear Thistle	0.693549	0.28	0.353660	0.370875	175
<i>Reseda luteola</i>	Wild Mignonette	0.537021	0.57	0.167145	0.340444	176

* includes *S. x chrysocoma*



Noxious Weeds Review; Phase 3a species
Corangamite CMA
Present distribution & calculation of potential distribution score

Common name	Scientific name	IPMS	area of infestation (ha)	FIS	Regional Estimate		Weight	Estimate based on: regional description, present potential ratio or gut feeling
		# infestations		# infestations	# infestations	area of infestation		
Cutth tree	<i>Acacia catechu</i>	0	0	0	0	0.100	1.00	PIRVic estimate
Prickly acacia	<i>Acacia nilotica</i>	0	0	0	0	0.100	1.00	PIRVic estimate
Annual ragweed	<i>Ambrosia artemisiifolia</i>	0	0	0	0	1.000	0.85	PIRVic estimate
Burr ragweed	<i>Ambrosia confertiflora</i>	0	0	0	0	1.000	0.85	PIRVic estimate
Lacy ragweed	<i>Ambrosia tenuifolia</i>	0	0	0	0	1.000	0.85	PIRVic estimate
Pond apple	<i>Annona glabra</i>	0	0	0	0	0.100	1.00	PIRVic estimate
Madeira vine	<i>Anredera cordifolia</i>	0	0	2	2	1.000	0.85	PIRVic estimate
Chinese violet	<i>Asystasia gangetica ssp. micrantha</i>	0	0	0	0	1.000	0.71	PIRVic estimate
Barleria, porcupine flower	<i>Barleria prionitis</i>	0	0	0	0	0.100	1.00	PIRVic estimate
Kochia	<i>Bassia scoparia</i>	0	0	0	0	1.000	0.85	PIRVic estimate
Cabomba	<i>Cabomba caroliniana</i>	0	0	0	0	0.100	0.85	PIRVic estimate
Heather	<i>Calluna vulgaris</i>	0	0	0		1.000	0.85	PIRVic estimate
Greater bindweed	<i>Calystegia silvatica</i>	0	0	2		1.000	0.85	PIRVic estimate
Glaucous star thistle	<i>Carthamus glaucus</i>	0	0	0	0	1.000	0.85	PIRVic estimate
Spotted knapweed	<i>Centaurea maculosa</i>	0	0	0	0	1.000	0.85	PIRVic estimate
Siam weed, chromolaena	<i>Chromolaena odorata</i>	0	0	0	0	0.100	1.00	PIRVic estimate
Rubber vine	<i>Cryptostegia grandiflora</i>	0	0	0	0	0.100	1.00	PIRVic estimate
Blue hound's tongue	<i>Cynoglossum creticum</i>	0	0	0	0	1.000	1.00	PIRVic estimate
Cyperus	<i>Cyperus teneristolon</i>	0	0	0		1.000	0.57	PIRVic estimate
African weed-orchid	<i>Disa bracteata</i>	0	0	2	1	100.000	0.71	Regional estimate
False yellowhead	<i>Dittrichia viscosa</i>	0	0	0	0	1.000	0.85	PIRVic estimate
Senegal tea plant	<i>Gymnocoronis spilanthoides</i>	0	0	1	0	1.000	0.71	PIRVic estimate
English ivy	<i>Hedera helix</i>	5	8	63	1000+	100.000	0.42	Regional estimate
Hymenachne, Olive hymenachne	<i>Hymenachne amplexicaulis</i>	0	0	0	0	0.100	1.00	PIRVic estimate
Large flowered St John's wort	<i>Hypericum calycinum</i>	0	0	1		1.000	0.85	PIRVic estimate
Canary Island St John's wort	<i>Hypericum canariense</i>	2	0	2	3	1.000	0.85	Regional estimate
Trailing St John's wort	<i>Hypericum humifusum</i>	0	0	0	0	1.000	1.00	PIRVic estimate
Chinese rain tree	<i>Koeleruteria elegans ssp. formosana</i>	0	0	0	0	0.000	1.00	PIRVic estimate
Yellow Soldier	<i>Lachenalia reflexa</i>	0	0	0	0	1.000	0.85	PIRVic estimate
Lantana	<i>Lantana camara</i>	0	0	0	1000+	50.000	0.57	Regional estimate
Miconia	<i>Miconia</i> spp.	0	0	0	0	0.000	1.00	PIRVic estimate
Mimosa, giant sensitive plant	<i>Mimosa pigra</i>	0	0	0	0	0.100	1.00	PIRVic estimate
Thistle	<i>Onopordum dissectum</i>	0	0	0		0.000	1.00	PIRVic estimate
Cotton thistle	<i>Onopordum nervosum</i>	0	0	0		1.000	1.00	PIRVic estimate
Taurian thistle	<i>Onopordum tauricum</i>	0	0	0	0	1.000	0.85	PIRVic estimate
Tiger pear	<i>Opuntia aurantiaca</i>	0	0	0	0	1.000	0.85	PIRVic estimate
Parkinsonia	<i>Parkinsonia aculeata</i>	0	0	0	0	0.100	1.00	PIRVic estimate
Garden geranium	<i>Pelargonium alchemilloides</i>	0	0	0	0	1.000	1.00	PIRVic estimate
Leaf cactus	<i>Pereskia aculeata</i>	0	0	0	0	0.000	1.00	PIRVic estimate
Uruguayan rice grass	<i>Piptochaetium montevidense</i>	0	0	0	0	1.000	0.85	PIRVic estimate
Praxelis	<i>Praxelis clematidea</i>	0	0	0	0	0.000	1.00	PIRVic estimate
White weeping broom	<i>Retama raetam</i>	0	0	0	0	1.000	0.85	PIRVic estimate
Giant bramble	<i>Rubus alceifolius</i>	0	0	0		0.000	1.00	PIRVic estimate
Florida blackberry	<i>Rubus argutus</i>	0	0	0		0.000	1.00	PIRVic estimate
Keriberry	<i>Rubus rugosus</i>	0	0	0		1.000	0.85	PIRVic estimate
Arrowhead	<i>Sagittaria montevidensis</i>	0	0	0	0	1.000	0.71	PIRVic estimate
Delta arrowhead	<i>Sagittaria platyphylla</i>	0	0	0	0	1.000	0.71	PIRVic estimate
Dwarf arrowhead	<i>Sagittaria pygmaea</i>	0	0	0	0	1.000	1.00	PIRVic estimate
Willows	<i>Salix alba</i>	0	0	46		46.000	0.42	PIRVic estimate (FIS)
Willows	<i>Salix cinerea</i>	0	0	30		30.000	0.57	PIRVic estimate (FIS)
Willows	<i>Salix fragilis</i>	0	0	1		1.000	0.57	PIRVic estimate (FIS)
Willows	<i>Salix humboldtiana</i>	0	0	0		0.100	0.71	PIRVic estimate (FIS)
Willows	<i>Salix matsudana</i>	0	0	2		2.000	0.57	PIRVic estimate (FIS)
Willows	<i>Salix nigra</i>	0	0	0		0.100	0.71	PIRVic estimate (FIS)
Willows	<i>Salix purpurea</i>	0	0	0		0.100	0.71	PIRVic estimate (FIS)
Willows	<i>Salix viminalis</i>	0	0	0		0.100	0.71	PIRVic estimate (FIS)
Willows	<i>Salix x pendulina</i>	0	0	0		0.100	0.71	PIRVic estimate (FIS)
Willows	<i>Salix x rubens</i>	3	0	36		36.000	0.42	PIRVic estimate (FIS)
Willows	<i>Salix x sepulcralis</i> ¹	0	0	0		0.100	0.71	PIRVic estimate (FIS)
Spotted thistle	<i>Scolymus maculatus</i>	0	0	0	0	1.000	0.85	PIRVic estimate
Holly leaved senecio	<i>Senecio glastifolius</i>	0	0	0	0	1.000	0.85	PIRVic estimate
Athel pine, tamarisk	<i>Tamarix aphylla</i>	0	0	0	0	0.100	0.71	PIRVic estimate
Laurel clock vine	<i>Thunbergia laurifolia</i>	0	0	0	0	0.000	1.00	PIRVic estimate
Rosewood, tipuana tree	<i>Tipuana tipu</i>	0	0	0	0	0.000	1.00	PIRVic estimate
Subterranean Cape sedge	<i>Trianoptiles solitaria</i>	0	0	0	0	1.000	0.85	PIRVic estimate

¹ includes *S. x chrysocoma*

Noxious Weeds Review; Phase 3a species
Corangamite CMA
Potential distribution by landuse and public land

Common name	Scientific name	Potential area* infested by landuse type						Potential total area
		Horticulture	Broadacre cropping	Forestry	Pasture dryland	Pasture irrigated	Public land	
Cutch tree	<i>Acacia catechu</i>	0	0	0	0	0	0	0
Prickly acacia	<i>Acacia nilotica</i>	0	0	0	725,300	518	718,000	1,443,818
Annual ragweed	<i>Ambrosia artemisiifolia</i>	21,642	0	0	962,750	518	5,019	989,929
Burr ragweed	<i>Ambrosia confertiflora</i>	0	0	0	962,750	518	12,943	976,211
Lacy ragweed	<i>Ambrosia tenuifolia</i>	0	0	0	962,750	0	5,019	967,769
Pond apple	<i>Annona glabra</i>	0	0	0	0	0	0	0
Madeira vine	<i>Anredera cordifolia</i>	0	0	2,730	0	0	234,100	236,830
Chinese violet	<i>Asystasia gangetica</i> ssp. <i>micrantha</i>	21,600	0	26,600	0	0	800	49,000
Barleria, porcupine flower	<i>Barleria prionitis</i>	0	0	0	0	0	0	0
Kochia	<i>Bassia scoparia</i>	0	0	0	962,750	0	5,000	967,750
Cabomba	<i>Cabomba caroliniana</i>	0	0	0	0	0	61,900	61,900
Heather	<i>Calluna vulgaris</i>	0	0	26,600	711,100	0	21,600	759,300
Greater bindweed	<i>Calystegia silvatica</i>	21,642	0	0	962,750	0	0	984,392
Glaucous star thistle	<i>Carthamus glaucus</i>	0	0	0	962,757	0	0	962,757
Spotted knapweed	<i>Centaurea maculosa</i>	0	0	0	962,750	518	4,500	967,768
Siam weed, chromolaena	<i>Chromolaena odorata</i>	0	0	0	0	0	0	0
Rubber vine	<i>Cryptostegia grandiflora</i>	0	0	0	0	0	0	0
Blue hound's tongue	<i>Cynoglossum creticum</i>	21,600	0	0	962,750	0	234,100	1,218,450
Cyperus	<i>Cyperus teneristolon</i>	0	0	0	0	518	7,290	7,808
African weed-orchid	<i>Disa bracteata</i>	0	0	0	962,750	518	140,684	1,103,952
False yellowhead	<i>Dittrichia viscosa</i>	0	0	0	962,750	518	4,668	967,936
Senegal tea plant	<i>Gymnocoronis spilanthoides</i>	0	0	0	0	518	63,900	64,418
English ivy	<i>Hedera helix</i>	0	0	27,281	0	0	264,545	291,826
Hymenachne, Olive hymenachne	<i>Hymenachne amplexicaulis</i>	0	0	0	772,772	0	113,926	886,698
Large flowered St John's wort	<i>Hypericum calycinum</i>	0	0	0	962,750	518	13,813	977,081
Canary Island St John's wort	<i>Hypericum canariense</i>	0	0	0	962,750	518	5,019	968,287
Trailing St John's wort	<i>Hypericum humifusum</i>	0	0	0	962,750	518	36,870	1,000,138
Chinese rain tree	<i>Koelreuteria elegans</i> ssp. <i>formosana</i>	0	0	0	0	0	0	0
Yellow Soldier	<i>Lachenalia reflexa</i>	0	0	0	125,814	0	3,443	129,257
Lantana	<i>Lantana camara</i>	0	0	27,300	962,750	518	195,800	1,186,368
Miconia	<i>Miconia</i> spp.	0	0	0	0	0	0	0
Mimosa, giant sensitive plant	<i>Mimosa pigra</i>	0	0	0	0	0	0	0
Thistle	<i>Onopordum dissectum</i>							N/A
Cotton thistle	<i>Onopordum nervosum</i>	21,642	0	0	962,750	0	33,174	1,017,566
Taurian thistle	<i>Onopordum tauricum</i>	0	0	0	962,750	518	32,623	995,891
Tiger pear	<i>Opuntia aurantiaca</i>	0	0	0	962,750	0	35,744	998,494
Parkinsonia	<i>Parkinsonia aculeata</i>	0	0	0	0	0	0	0
Garden geranium	<i>Pelargonium alchemilloides</i>	0	0	0	962,750	518	87,334	1,050,602
Leaf cactus	<i>Pereskia aculeata</i>	0	0	0	0	0	0	0
Uruguayan rice grass	<i>Piptochaetium montevidense</i>	0	0	0	851,100	0	4,500	855,600
Praxelis	<i>Praxelis clematidea</i>	0	0	0	0	0	0	0
White weeping broom	<i>Retama raetam</i>	0	0	0	962,750	0	12,943	975,693
Giant bramble	<i>Rubus alceifolius</i>	0	0	0	0	0	0	0
Florida blackberry	<i>Rubus argutus</i>	0	0	0	0	0	0	0
Keriberry	<i>Rubus rugosus</i>	0	0	0	0	0	106,694	106,694
Arrowhead	<i>Sagittaria montevidensis</i>	0	0	0	0	518	62,200	62,718
Delta arrowhead	<i>Sagittaria platyphylla</i>	0	0	0	0	518	62,200	62,718
Dwarf arrowhead	<i>Sagittaria pygmaea</i>	0	0	0	0	0	0	0
Willows	<i>Salix alba</i>	0	0	0	0	0	1,925	1,925
Willows	<i>Salix cinerea</i>	0	0	0	0	0	68,493	68,493
Willows	<i>Salix fragilis</i>	0	0	0	0	0	1,925	1,925
Willows	<i>Salix humboldtiana</i>	0	0	0	0	0	1,420	1,420
Willows	<i>Salix matsudana</i>	0	0	0	0	0	1,925	1,925
Willows	<i>Salix nigra</i>	0	0	0	0	0	1,925	1,925
Willows	<i>Salix purpurea</i>	0	0	0	0	0	1,925	1,925
Willows	<i>Salix viminalis</i>	0	0	0	0	0	1,925	1,925
Willows	<i>Salix x pendulina</i>	0	0	0	0	0	1,925	1,925
Willows	<i>Salix x rubens</i>	0	0	0	0	0	1,925	1,925
Willows	<i>Salix x sepulcralis</i> ¹	0	0	0	0	0	1,925	1,925
Spotted thistle	<i>Scolymus maculatus</i>	0	0	0	237,422	0	0	237,422
Holly leaved senecio	<i>Senecio glastifolius</i>	0	0	0	962,750	518	6,425	969,693
Athel pine, tamarisk	<i>Tamarix aphylla</i>	0	0	0	0	0	1,304	1,304
Laurel clock vine	<i>Thunbergia laurifolia</i>	0	0	0	0	0	0	0
Rosewood, tipuana tree	<i>Tipuana tipu</i>	0	0	0	0	0	0	0
Subterranean Cape sedge	<i>Trianoptiles solitaria</i>	0	0	0	0	518	106,934	107,452

*unit of measure is hectare
N/A = not available (too few data)
¹ includes *S. x chrysocoma*

Noxious Weeds Review; Phase 3a species
East Gippsland CMA
Regional score and rank

Scientific name	Common name	Inv. Score	Regional dist.	Impact Score	Regional score	Regional rank	Rank Relative to Phases 1&2
<i>Acacia catechu</i>	Cutch tree	0.6061	1.00	0.1080	0.4732	60	144
<i>Acacia nilotica</i>	Prickly acacia	0.5744	1.00	0.5345	0.7082	5	6
<i>Ambrosia artemisiifolia</i>	Annual ragweed	0.5760	0.85	0.2849	0.5177	49	107
<i>Ambrosia confertiflora</i>	Burr ragweed	0.5941	0.85	0.2267	0.4872	59	137
<i>Ambrosia tenuifolia</i>	Lacy ragweed	0.6041	0.85	0.1411	0.4405	65	159
<i>Annona glabra</i>	Pond apple	0.6948	1.00	0.2587	0.5682	39	66
<i>Anredera cordifolia</i>	Madeira vine	0.7660	0.85	0.3585	0.5817	33	57
<i>Asystasia gangetica</i> ssp. <i>micrantha</i>	Chinese violet	0.5931	0.85	0.2305	0.4893	58	134
<i>Barleria prionitis</i>	Barleria, porcupine flower	0.7002	1.00	0.1502	0.5081	52	115
<i>Bassia scoparia</i>	Kochia	0.6106	1.00	0.3563	0.6128	25	43
<i>Cabomba caroliniana</i>	Cabomba	0.6202	0.85	0.4813	0.6330	17	34
<i>Calluna vulgaris</i>	Heather	0.6742	1.00	0.2891	0.5828	32	56
<i>Calystegia silvatica</i>	Greater bindweed	0.3180	0.85	0.2593	0.4724	62	146
<i>Carthamus glaucus</i>	Glaucous star thistle	0.5168	0.85	0.3251	0.5331	46	97
<i>Centaurea maculosa</i>	Spotted knapweed	0.7544	0.85	0.5016	0.6604	13	23
<i>Chromolaena odorata</i>	Siam weed, chromolaena	0.7892	1.00	0.4469	0.6850	9	18
<i>Cryptostegia grandiflora</i>	Rubber vine	0.7574	1.00	0.4880	0.7042	7	8
<i>Cynoglossum creticum</i>	Blue hound's tongue	0.5987	1.00	0.2110	0.5300	47	100
<i>Cyperus teneristolon</i>	Cyperus	0.7330	0.85	0.2058	0.4922	56	129
<i>Disa bracteata</i>	African weed-orchid	0.7635	1.00	0.2567	0.5754	38	63
<i>Dittrichia viscosa</i>	False yellowhead	0.6756	1.00	0.2327	0.5514	43	83
<i>Gymnocoronis spilanthoides</i>	Senegal tea plant	0.4856	0.85	0.3575	0.5475	44	87
<i>Hedera helix</i>	English ivy	0.7455	0.42	0.3875	0.4493	64	156
<i>Hymenachne amplexicaulis</i>	Hymenachne, Olive hymenachne	0.6675	1.00	0.6456	0.7816	2	2
<i>Hypericum calycinum</i>	Large flowered St John's wort	0.5533	0.85	0.3388	0.5451	45	88
<i>Hypericum canariense</i>	Canary Island St John's wort	0.5055	0.85	0.2873	0.5106	51	112
<i>Hypericum humifusum</i>	Trailing St John's wort	0.4552	0.85	0.2088	0.4606	63	151
<i>Koelreuteria elegans</i> ssp. <i>formosana</i>	Chinese rain tree	0.5911	1.00	0.1677	0.5048	54	118
<i>Lachenalia reflexa</i>	Yellow Soldier	0.4270	1.00	0.3116	0.5657	40	67
<i>Lantana camara</i>	Lantana	0.6496	0.42	0.6372	0.5776	37	61
<i>Miconia</i> spp.	Miconia	0.8664	1.00	0.3037	0.6140	24	42
<i>Mimosa pigra</i>	Mimosa, giant sensitive plant	0.8180	1.00	0.3506	0.6345	14	30
<i>Onopordum dissectum</i>	Thistle	0.4312	1.00	0.3832	0.6063	29	48
<i>Onopordum nervosum</i>	Cotton thistle	0.5962	0.85	0.4685	0.6229	20	38
<i>Onopordum tauricum</i>	Taurian thistle	0.4682	0.71	0.3464	0.4916	57	130
<i>Opuntia aurantiaca</i>	Tiger pear	0.6516	0.85	0.6580	0.7357	3	3
<i>Parkinsonia aculeata</i>	Parkinsonia	0.6416	1.00	0.5568	0.7288	4	4
<i>Pelargonium alchemilloides</i>	Garden geranium	0.6058	1.00	0.3686	0.6191	22	40
<i>Pereskia aculeata</i>	Leaf cactus	0.7889	1.00	0.7331	0.8452	1	1
<i>Piptochaetium montevidense</i>	Uruguayan rice grass	0.7066	1.00	0.3544	0.6233	19	37
<i>Praxelis clematidea</i>	Praxelis	0.7051	1.00	0.3349	0.6121	26	44
<i>Retama raetam</i>	White weeping broom	0.6883	1.00	0.5053	0.7056	6	7
<i>Rubus alceifolius</i>	Giant bramble	0.6207	1.00	0.1977	0.5252	48	104
<i>Rubus argutus</i>	Florida blackberry	0.8084	0.85	0.4430	0.6341	15	31
<i>Rubus rugosus</i>	Keriberry	0.6752	0.85	0.4284	0.6100	27	45
<i>Sagittaria montevidensis</i>	Arrowhead	0.6835	0.71	0.4546	0.5780	35	59
<i>Sagittaria platyphylla</i>	Delta arrowhead	0.6835	0.71	0.4546	0.5780	35	59
<i>Sagittaria pygmaea</i>	Dwarf arrowhead	0.6835	1.00	0.4546	0.6766	11	20
<i>Salix alba</i>	Willows	0.5995	0.57	0.5951	0.5990	30	50
<i>Salix cinerea</i>	Willows	0.9190	0.57	0.6668	0.6775	10	19
<i>Salix fragilis</i>	Willows	0.5141	0.57	0.6283	0.6073	28	46
<i>Salix humboltiana</i>	Willows	0.5007	1.00	0.3397	0.5903	31	51
<i>Salix matsudana</i>	Willows	0.5980	0.85	0.3534	0.5586	41	75
<i>Salix nigra</i>	Willows	0.5656	0.85	0.5594	0.6701	12	22
<i>Salix purpurea</i>	Willows	0.7995	0.71	0.6302	0.6902	8	15
<i>Salix viminalis</i>	Willows	0.5605	0.85	0.4960	0.6340	16	32
<i>Salix x pendulina</i>	Willows	0.5864	0.85	0.2763	0.5141	50	109
<i>Salix x rubens</i>	Willows	0.6057	0.57	0.6283	0.6183	23	41
<i>Salix x sepulcralis</i> ¹	Willows	0.5920	0.85	0.3534	0.5579	42	76

Noxious Weeds Review; Phase 3a species
 East Gippsland CMA
 Regional score and rank

Scientific name	Common name	Inv. Score	Regional dist.	Impact Score	Regional score	Regional rank	Rank Relative to Phases 1&2
<i>Scolymus maculatus</i>	Spotted thistle	0.7940	0.85	0.2136	0.5039	55	119
<i>Senecio glastifolius</i>	Holly leaved senecio	0.5973	1.00	0.3018	0.5807	34	58
<i>Tamarix aphylla</i>	Athel pine, tamarisk	0.6738	1.00	0.3558	0.6201	21	39
<i>Thunbergia laurifolia</i>	Laurel clock vine	0.4405	1.00	0.4150	0.6253	18	36
<i>Tipuana tipu</i>	Rosewood, tipuana tree	0.4541	1.00	0.1403	0.4731	61	145
<i>Trianoptiles solitaria</i>	Subterranean Cape sedge	0.5107	1.00	0.1887	0.5069	53	117

* includes *S. x chrysocoma*



Noxious Weeds Review; Phase 3a species
 East Gippsland CMA
 Ranked order relative to Phase 1 & 2 (highlighted in red)

Scientific name	Common name	Invasiveness Score	Regional Dist	Impact Scores	Final Score	RANK
<i>Pereskia aculeata</i>	Leaf cactus	0.788886	1.00	0.733119	0.845213	1
<i>Hymenachne amplexicaulis</i>	Hymenachne, Olive hymenachne	0.667534	1.00	0.645600	0.781640	2
<i>Opuntia aurantiaca</i>	Tiger pear	0.651556	0.85	0.657976	0.735653	3
<i>Parkinsonia aculeata</i>	Parkinsonia	0.641562	1.00	0.556809	0.728801	4
<i>Eichhornia crassipes</i>	Water Hyacinth	0.879335	1	0.527622	0.720989	5
<i>Acacia nilotica</i>	Prickly acacia	0.574417	1.00	0.534471	0.708234	6
<i>Retama raetam</i>	White weeping broom	0.688328	1.00	0.505316	0.705576	7
<i>Cryptostegia grandiflora</i>	Rubber vine	0.757375	1.00	0.488003	0.704167	8
<i>Orobanche ramosa</i>	Branched Broomrape	0.769900	1	0.519638	0.703385	9
<i>Pennisetum macrourum</i>	African Feather Grass	0.612026	0.85	0.627185	0.696667	10
<i>Acacia erioloba</i>	Giraffe thorn	0.700000	1	0.519638	0.694997	11
<i>Hieracium</i> spp.	Hawkweeds	0.700000	1	0.519638	0.694997	11
<i>Nassella tenuissima</i>	Mexican feather grass	0.700000	1	0.519638	0.694997	11
<i>Acacia karroo</i>	Karoo thorn	0.670000	1	0.519638	0.691397	14
<i>Salix purpurea</i>	Willows	0.799511	0.71	0.630180	0.690242	15
<i>Nassella charruana</i>	Lobed needle grass	0.650000	1	0.519638	0.688997	16
<i>Salvinia molesta</i>	Salvinia	0.587464	1	0.529090	0.686786	17
<i>Chromolaena odorata</i>	Siam weed, chromolaena	0.789234	1.00	0.446929	0.684988	18
<i>Salix cinerea</i>	Willows	0.919002	0.57	0.666778	0.677476	19
<i>Sagittaria pygmaea</i>	Dwarf arrowhead	0.683469	1.00	0.454599	0.676592	20
<i>Fallopia japonica</i> , <i>Fallopia sachalinensis</i>	Japanese and Giant knotweed	0.506400	1	0.519638	0.671765	21
<i>Salix nigra</i>	Willows	0.565578	0.85	0.559364	0.670113	22
<i>Centaurea maculosa</i>	Spotted knapweed	0.754357	0.85	0.501646	0.660445	23
<i>Parthenium hysterophorus</i>	Parthenium Weed	0.825166	1	0.420087	0.654269	24
<i>Nassella trichotoma</i>	Serrated Tussock	0.761536	0.57	0.675277	0.651939	25
<i>Equisetum</i> spp.	Horsetails	0.726000	0.85	0.519638	0.650117	26
<i>Alternanthera philoxeroides</i>	Alligator Weed	0.527352	0.57	0.719621	0.648670	27
<i>Prosopis</i> spp.	Mesquite	0.658431	0.85	0.521093	0.642824	28
<i>Iva axillaris</i>	Poverty Weed	0.538501	1	0.453036	0.638320	29
<i>Mimosa pigra</i>	Mimosa, giant sensitive plant	0.818008	1.00	0.350578	0.634484	30
<i>Rubus argutus</i>	Florida blackberry	0.808417	0.85	0.442982	0.634080	31
<i>Salix viminalis</i>	Willows	0.560486	0.85	0.495981	0.634008	32
<i>Rubus fruticosus</i> agg.	Blackberry	0.767146	0.42	0.726464	0.633277	33
<i>Cabomba caroliniana</i>	Cabomba	0.620155	0.85	0.481313	0.632954	34
<i>Xanthium spinosum</i>	Noogoora Burr/ Californian Burr	0.619536	0.85	0.500315	0.626521	35
<i>Thunbergia laurifolia</i>	Laurel clock vine	0.440524	1.00	0.415005	0.625266	36
<i>Piptochaetium montevidense</i>	Uruguayan rice grass	0.706617	1.00	0.354400	0.623258	37
<i>Onopordum nervosum</i>	Cotton thistle	0.596175	0.85	0.468505	0.622904	38
<i>Tamarix aphylla</i>	Athel pine, tamarisk	0.673811	1.00	0.355786	0.620097	39
<i>Pelargonium alchemilloides</i>	Garden geranium	0.605828	1.00	0.368643	0.619139	40
<i>Salix x rubens</i>	Willows	0.605670	0.57	0.628311	0.618335	41
<i>Miconia</i> spp.	Miconia	0.866385	1.00	0.303706	0.614041	42
<i>Bassia scoparia</i>	Kochia	0.610614	1.00	0.356267	0.612783	43
<i>Praxelis clematidea</i>	Praxelis	0.705095	1.00	0.334863	0.612135	44
<i>Rubus rugosus</i>	Keriberry	0.675226	0.85	0.428443	0.609955	45
<i>Salix fragilis</i>	Willows	0.514090	0.57	0.628311	0.607345	46
<i>Convolvulus arvensis</i>	Bindweed	0.779101	0.85	0.430366	0.606497	47
<i>Onopordum dissectum</i>	Thistle	0.431190	1.00	0.383170	0.606318	48
<i>Echium vulgare</i>	Viper's Bugloss	0.655865	0.85	0.446556	0.600775	49
<i>Salix alba</i>	Willows	0.599482	0.57	0.595056	0.598969	50
<i>Salix humboldtiana</i>	Willows	0.500663	1.00	0.339666	0.590293	51
<i>Lagarosiphon major</i>	Lagarosiphon	0.649037	1	0.342517	0.589694	52
<i>Homeria flaccida</i>	Cape Tulip (two-leaf)	0.684162	0.85	0.417379	0.587832	53
<i>Centaurea solstitialis</i>	St. Barnaby's Thistle	0.655091	0.85	0.423400	0.587715	54
<i>Ulex europaeus</i>	Furze/Gorse	0.828248	0.57	0.545087	0.587038	55
<i>Calluna vulgaris</i>	Heather	0.674172	1.00	0.289081	0.582786	56
<i>Anredera cordifolia</i>	Madeira vine	0.766046	0.85	0.358456	0.581661	57
<i>Senecio glastifolius</i>	Holly leaved senecio	0.597307	1.00	0.301771	0.580669	58
<i>Sagittaria montevidensis</i>	Arrowhead	0.683469	0.71	0.454599	0.577992	59
<i>Sagittaria platyphylla</i>	Delta arrowhead	0.683469	0.71	0.454599	0.577992	59
<i>Lantana camara</i>	Lantana	0.649647	0.42	0.637247	0.577616	61
<i>Acroptilon repens</i>	Hardheads/Russian Knapweed	0.514006	0.85	0.434553	0.577030	62
<i>Disa bracteata</i>	African weed-orchid	0.763497	1.00	0.256714	0.575379	63
<i>Nassella neesiana</i>	Chilean needle grass	0.686622	0.57	0.543816	0.569332	64
<i>Cirsium arvense</i>	Californian/Perennial Thistle	0.702729	0.71	0.458673	0.568385	65
<i>Annona glabra</i>	Pond apple	0.694802	1.00	0.258663	0.568228	66
<i>Lachenalia reflexa</i>	Yellow Soldier	0.426976	1.00	0.311622	0.565746	67
<i>Homeria miniata</i>	Cape Tulip (one-leaf)	0.747658	0.71	0.440860	0.563800	68
<i>Rosa rubiginosa</i>	Sweet Briar	0.793721	0.57	0.508953	0.562660	69

Noxious Weeds Review; Phase 3a species
 East Gippsland CMA
 Ranked order relative to Phase 1 & 2 (highlighted in red)

Scientific name	Common name	Invasiveness Score	Regional Dist	Impact Scores	Final Score	RANK
Cytisus scoparius	English Broom	0.734874	0.57	0.520938	0.562310	70
Onopordum illyricum	Illyrian Thistle	0.533147	0.85	0.401999	0.561097	71
Datura ferox	Thorn Apple (common)	0.703633	0.71	0.444751	0.560697	72
Datura stramonium	Thorn Apple (longspine)	0.703600	0.71	0.444751	0.560693	73
Datura inoxia	Thorn Apple (recurved)	0.703600	0.71	0.444751	0.560693	73
Salix matsudana	Willows	0.598025	0.85	0.353359	0.558644	75
Salix x sepulcralis	Willows	0.592031	0.85	0.353359	0.557925	76
Alhagi maurorum	Camelthorn	0.569959	0.85	0.386286	0.556715	77
Cuscuta spp.	Dodder	0.734033	0.71	0.429397	0.555746	78
Hypericum triquetrifolium	Tangled Hypericum	0.602251	0.85	0.377231	0.555520	79
Cannabis sativa	Marijuana	0.565385	1	0.297461	0.554424	80
Onopordum acanthium	Scotch/Heraldic Thistle	0.571238	0.85	0.381627	0.554260	81
Allium triquetrum	Angled Onion	0.614461	0.71	0.448094	0.551868	82
Dittrichia viscosa	False yellowhead	0.675616	1.00	0.232653	0.551360	83
Tribulus terrestris	Caltrop	0.606654	0.85	0.368584	0.551205	84
Festuca gautieri	bearskin fescue	0.491440	0.85	0.387816	0.548150	85
Amsinckia spp.	Amsinckia	0.745464	0.85	0.333240	0.548070	86
Gymnocoronis spilanthoides	Senegal tea plant	0.485586	0.85	0.357542	0.547494	87
Hypericum calycinum	Large flowered St John's wort	0.553290	0.85	0.338782	0.545113	88
Salpichroa origanifolia	Pampas Lily-of-the-Valley	0.762638	0.85	0.320066	0.542753	89
Opuntia robusta	Wheel Cactus	0.645158	0.85	0.345016	0.542628	90
Senecio pterophorus	African Daisy	0.676556	0.85	0.337358	0.542107	91
Chondrilla juncea	Skeleton Weed	0.742382	0.85	0.315662	0.537856	92
Ailanthus altissima	Tree of Heaven	0.895314	0.57	0.441183	0.536900	93
Cardaria draba	Hoary Cress	0.563497	0.71	0.429138	0.535137	94
Ambrosia psilostachya	Perennial Ragweed	0.489293	0.85	0.364356	0.534755	95
Eragrostis curvula	African Lovegrass	0.715330	0.85	0.314456	0.533935	96
Carthamus glaucus	Glaucous star thistle	0.516750	0.85	0.325102	0.533067	97
Opuntia stricta	Prickly Pear (drooping)	0.552003	0.85	0.345016	0.531449	98
Lavandula stoechas	Topped Lavender	0.682210	0.85	0.316423	0.531062	99
Cynoglossum creticum	Blue hound's tongue	0.598661	1.00	0.210974	0.529985	100
Marrubium vulgare	Horehound	0.771737	0.57	0.451853	0.528046	101
Lycium ferocissimum	Boxthorn	0.674957	0.57	0.470710	0.526993	102
Centaurea nigra	Black Knapweed	0.641607	0.85	0.317275	0.526667	103
Rubus alceifolius	Giant bramble	0.620743	1.00	0.197677	0.525188	104
Alternanthera pungens	Khaki Weed	0.653479	0.85	0.303604	0.520436	105
Cytisus multiflorus	white Spanish broom	0.517034	0.85	0.330775	0.519278	106
Ambrosia artemisiifolia	Annual ragweed	0.575985	0.85	0.284903	0.517664	107
Cestrum parqui	Chilean Cestrum	0.727801	0.71	0.358471	0.515280	108
Salix x pendulina	Willows	0.586438	0.85	0.276310	0.514106	109
Conium maculatum	Hemlock	0.665290	0.57	0.446703	0.512388	110
Opuntia vulgaris	Prickly Pear (erect)	0.759228	0.71	0.345016	0.511516	111
Hypericum canariense	Canary Island St John's wort	0.505525	0.85	0.287333	0.510570	112
Sagittaria graminea	Arrowhead	0.586551	0.85	0.298489	0.509540	113
Sida leprosa	Ivy-leafed Sida	0.485639	1	0.234041	0.509339	114
Barleria prionitis	Barleria, porcupine flower	0.700199	1.00	0.150169	0.508118	115
Solanum elaeagnifolium	Silverleaf Nightshade	0.667968	0.71	0.357925	0.507794	116
Trianoptiles solitaria	Subterranean Cape sedge	0.510665	1.00	0.188664	0.506932	117
Koeleruteria elegans ssp.formos.	Chinese rain tree	0.591073	1.00	0.167702	0.504842	118
Scolymus maculatus	Spotted thistle	0.794014	0.85	0.213592	0.503893	119
Calicotome spinosa	Spiny Broom	0.447135	0.85	0.317558	0.503489	120
Crataegus monogyna	Hawthorn	0.704590	0.42	0.506902	0.502816	121
Spartium junceum	Spanish broom	0.341815	0.85	0.33587	0.501105	122
Scolymus hispanicus	Golden Thistle	0.497723	0.71	0.377717	0.498448	123
Hypericum tetrapterum	St. Peter's Wort	0.552896	0.85	0.284303	0.497557	124
Cenchrus longispinus	Spiny Burr Grass/ Gentle Annie	0.402417	0.85	0.313125	0.495640	125
Onopordum acaulon	Stemless Thistle	0.528267	0.85	0.285015	0.495001	126
Cynara cardunculus	Artichoke Thistle	0.662745	0.57	0.413264	0.493358	127
Echium plantagineum	Paterson's Curse	0.665066	0.57	0.412722	0.493332	128
Cyperus teneristolon	Cyperus	0.732975	0.85	0.205759	0.492182	129
Onopordum tauricum	Taurian thistle	0.468246	0.71	0.346370	0.491557	130
Silybum marianum	Variegated Thistle	0.765111	0.57	0.387726	0.491340	131
Centaurea calcitrapa	Star Thistle	0.408196	0.85	0.303943	0.491192	132
Juncus acutus	Spiny Rush	0.516930	0.57	0.438554	0.490022	133
Asystasia gangetica ssp. micranth	Chinese violet	0.593129	0.85	0.230522	0.489268	134
Carduus nutans	Nodding Thistle	0.390918	0.85	0.302426	0.488269	135
Physalis viscosa	Prairie Ground Cherry	0.727781	0.71	0.309365	0.487778	136
Ambrosia confertiflora	Burr ragweed	0.594088	0.85	0.226697	0.487241	137
Genista linifolia	Flax Leaved Broom	0.703726	0.57	0.392163	0.486458	138

Noxious Weeds Review; Phase 3a species
 East Gippsland CMA
 Ranked order relative to Phase 1 & 2 (highlighted in red)

Scientific name	Common name	Invasiveness Score	Regional Dist	Impact Scores	Final Score	RANK
Nassella hyalina	cane needle grass	0.503576	0.85	0.267807	0.482401	139
Ibicella lutea	Devil's Claw (yellowflower)	0.616016	0.85	0.241384	0.481097	140
Asparagus asparagoides	bridal creeper	0.782848	0.57	0.361907	0.479010	141
Emex australis	Spiny Emex	0.535113	0.85	0.247396	0.474755	142
Cirsium acarna	Soldier Thistle	0.523968	0.85	0.249563	0.474632	143
Acacia catechu	Cutch tree	0.606058	1.00	0.107969	0.473190	144
Tipuana tipu	Rosewood, tipuana tree	0.454073	1.00	0.140342	0.473080	145
Calystegia silvatica	Greater bindweed	0.317991	0.85	0.259324	0.472380	146
Proboscidea louisianica	Devil's Claw (purpleflower)	0.542172	0.85	0.241384	0.472236	147
Hypericum androsaemum	Tutsan	0.746650	0.71	0.276452	0.471611	148
Solanum rostratum	Buffalo Burr	0.468698	0.85	0.254399	0.470707	149
Carthamus lanatus	Saffron Thistle	0.499430	0.57	0.405518	0.469422	150
Hypericum humifusum	Trailing St John's wort	0.455230	0.85	0.208817	0.460565	151
Carduus tenuiflorus / C. pycnocephalus	Slender/Shore Thistle	0.608219	0.57	0.359060	0.456460	152
Pittosporum undulatum	sweet pittosporum	0.793704	0.57	0.315117	0.454110	153
Genista monspessulana	Cape Broom /Montpellier Broom	0.698418	0.42	0.419839	0.453320	154
Xanthium strumarium	Bathurst Burr	0.585163	0.57	0.356250	0.452120	155
Hedera helix	English ivy	0.745474	0.42	0.387495	0.449254	156
Hypericum perforatum	St. John's Wort	0.660601	0.57	0.334271	0.448864	157
Leucanthemum vulgare	Ox-eye Daisy	0.610238	0.57	0.333108	0.442169	158
Ambrosia tenuifolia	Lacy ragweed	0.604084	0.85	0.141134	0.440525	159
Chrysanthemoides monilifera	Boneseed/Bitou Bush	0.799614	0.42	0.375091	0.440405	160
Nassella leucotricha	Texas needle grass	0.627929	0.57	0.326146	0.440393	161
Dittrichia graveolens	Stinkwort	0.607585	0.57	0.319717	0.434352	162
Senecio jacobaea	Ragwort	0.776347	0.42	0.363784	0.431281	163
Vinca major	blue periwinkle	0.703021	0.57	0.289181	0.428704	164
Dipsacus fullonum	Wild Teasel	0.551563	0.57	0.309552	0.421937	165
Allium vineale	Wild Garlic	0.658241	0.57	0.285822	0.421449	166
Melianthus comosus	Tufted Honeyflower	0.492463	0.42	0.394016	0.414144	167
Solanum linnaeanum	Apple of Sodom	0.356227	0.57	0.325025	0.407161	168
Verbascum thapsus	Great Mullein	0.474171	0.57	0.296038	0.405082	169
Watsonia meriana 'Bulbillifera'	Wild Watsonia	0.402004	0.57	0.307647	0.402923	170
Foeniculum vulgare	Fennel	0.574220	0.42	0.326980	0.386415	171
Oxalis pes-caprae	Soursob	0.743995	0.28	0.365451	0.383532	172
Asphodelus fistulosus	Onion Weed	0.539790	0.42	0.328848	0.383330	173
Diplotaxis tenuifolia	Sand Rocket/Sand Mustard	0.565974	0.42	0.317803	0.380286	174
Cirsium vulgare	Spear Thistle	0.693549	0.28	0.353660	0.370875	175
Reseda luteola	Wild Mignonette	0.537021	0.57	0.167145	0.340444	176



Noxious Weeds Review; Phase 3a species

East Gippsland CMA

Present distribution and calculation of potential distribution score

Common name	Scientific name	IPMS	area of infestation (ha)	FIS	Regional Estimate		Weight	Estimate based on: regional description, present potential ratio or gut feeling
		# infestations		# infestations	# infestations	area of infestation		
Cutch tree	<i>Acacia catechu</i>	0	0	0	0	0.100	1.00	Gut Feel
Prickly acacia	<i>Acacia nilotica</i>	0	0	0	0	0.100	1.00	Gut Feel
Annual ragweed	<i>Ambrosia artemisiifolia</i>	0	0	0	0	1.000	0.85	PIRVic estimate
Burr ragweed	<i>Ambrosia confertiflora</i>	0	0	0	0	1.000	0.85	PIRVic estimate
Lacy ragweed	<i>Ambrosia tenuifolia</i>	0	0	0	0	1.000	0.85	PIRVic estimate
Pond apple	<i>Annona glabra</i>	0	0	0	0	0.100	1.00	Gut Feel
Madeira vine	<i>Anredera cordifolia</i>	2	1	2	>10	10.000	0.85	Snowy and Mitchell Rivers Bill Peel Estimate
Chinese violet	<i>Asystasia gangetica ssp. Micrantha</i>	0	0	0	0	0.100	0.85	Gut Feel
Barleria, porcupine flower	<i>Barleria prionitis</i>	0	0	0	0	0.100	1.00	Gut Feel
Kochia	<i>Bassia scoparia</i>	0	0	0	0	0.100	1.00	Gut Feel
Cabomba	<i>Cabomba caroliniana</i>	0	0	0	0	0.100	0.85	Gut Feel
Heather	<i>Calluna vulgaris</i>	0	0	0	0	0.100	1.00	Gut Feel
Greater bindweed	<i>Calystegia silvatica</i>	0	0	0	1	1.000	0.85	Nowa Nowa Bill Peel Estimate
Glaucous star thistle	<i>Carthamus glaucus</i>	0	0	0	0	1.000	0.85	Gut Feel
Spotted knapweed	<i>Centaurea maculosa</i>	0	0	0	0	1.000	0.85	Gut Feel
Siam weed, chromolaena	<i>Chromolaena odorata</i>	0	0	0	0	0.100	1.00	Gut Feel
Rubber vine	<i>Cryptostegia grandiflora</i>	0	0	0	0	0.100	1.00	Gut Feel
Blue hound's tongue	<i>Cynoglossum creticum</i>	0	0	0	0	0.100	1.00	Gut Feel
Cyperus	<i>Cyperus teneristolon</i>	0	0	0	0	0.100	0.85	Gut Feel
African weed-orchid	<i>Disa bracteata</i>	0	0	0	0	1.000	1.00	Gut Feel
False yellowhead	<i>Dittrichia viscosa</i>	0	0	0	0	0.100	1.00	Gut Feel
Senegal tea plant	<i>Gymnocoronis spilanthoides</i>	0	0	0	0	0.100	0.85	Gut Feel
English ivy	<i>Hedera helix</i>	1	0	21	>20	20.000	0.42	Bairnsdale, lakes Entrance, Nowa Nowa, urban areas Bill Peel Estimate
Hymenachne, Olive hymenachne	<i>Hymenachne amplexicaulis</i>	0	0	0	0	0.100	1.00	Gut Feel
Large flowered St John's wort	<i>Hypericum calycinum</i>	0	0	0	0	1.000	0.85	Gut Feel
Canary Island St John's wort	<i>Hypericum canariense</i>	0	0	0	0	1.000	0.85	Gut Feel
Trailing St John's wort	<i>Hypericum humifusum</i>	0	0	1	0	1.000	0.85	Gut Feel, question 0 area
Chinese rain tree	<i>Koeleruteria elegans ssp.formosana</i>	0	0	0	0	0.100	1.00	Gut Feel
Yellow Soldier	<i>Lachenalia reflexa</i>	0	0	0	0	0.100	1.00	Gut Feel
Lantana	<i>Lantana camara</i>	0	0	0	1	0.100	0.42	Removed. Bete Belong Bill Peel Estimate
Miconia	<i>Miconia spp.</i>	0	0	0	0	1.000	1.00	Gut Feel
Mimosa, giant sensitive plant	<i>Mimosa pigra</i>	0	0	0	0	1.000	1.00	Gut Feel
Thistle	<i>Onopordum dissectum</i>	0	0	0	0	0.000	1.00	Gut Feel
Cotton thistle	<i>Onopordum nervosum</i>	0	0	0	0	1.000	0.85	PIRVic estimate
Taurian thistle	<i>Onopordum tauricum</i>	0	0	0	0	1.000	0.71	Gut Feel
Tiger pear	<i>Opuntia aurantiaca</i>	0	0	0	0	1.000	0.85	Gut Feel
Parkinsonia	<i>Parkinsonia aculeata</i>	0	0	0	0	0.100	1.00	Gut Feel
Garden geranium	<i>Pelargonium alchemilloides</i>	0	0	0	0	0.100	1.00	Gut Feel
Leaf cactus	<i>Pereskia aculeata</i>	0	0	0	0	0.100	1.00	Gut Feel
Uruguayan rice grass	<i>Piptochaetium montevidense</i>	0	0	0	0	0.100	1.00	Gut Feel
Praxelis	<i>Praxelis clematidea</i>	0	0	0	0	0.100	1.00	Gut Feel
White weeping broom	<i>Retama raetam</i>	0	0	0	0	0.100	1.00	Gut Feel
Giant bramble	<i>Rubus alceifolius</i>	0	0	0	0	1.000	1.00	Gut Feel
Florida blackberry	<i>Rubus argutus</i>	0	0	0	0	1.000	0.85	Gut Feel
Keriberry	<i>Rubus rugosus</i>	0	0	0	0	1.000	0.85	Gut Feel
Arrowhead	<i>Sagittaria montevidensis</i>	0	0	0	0	1.000	0.71	Gut Feel
Delta arrowhead	<i>Sagittaria platyphylla</i>	0	0	0	0	1.000	0.71	Gut Feel
Dwarf arrowhead	<i>Sagittaria pygmaea</i>	0	0	0	0	1.000	1.00	Gut Feel
Willows	<i>Salix alba</i>	1	5	2	3	5.000	0.57	PIRVic estimate (FIS)
Willows	<i>Salix cinerea</i>	0	0	13	13	13.000	0.57	PIRVic estimate (FIS)
Willows	<i>Salix fragilis</i>	12	59	1	13	59.000	0.57	PIRVic estimate (IPMS)
Willows	<i>Salix humboldtiana</i>	0	0	0	0	0.100	1.00	PIRVic estimate
Willows	<i>Salix matsudana</i>	0	0	0	0	0.100	0.85	PIRVic estimate
Willows	<i>Salix nigra</i>	0	0	0	0	0.100	0.85	PIRVic estimate
Willows	<i>Salix purpurea</i>	0	0	1	1	1.000	0.71	PIRVic estimate
Willows	<i>Salix viminalis</i>	0	0	0	0	0.100	0.85	PIRVic estimate
Willows	<i>Salix x pendulina</i>	0	0	0	0	0.100	0.85	PIRVic estimate
Willows	<i>Salix x rubens</i>	0	0	14	14	14.000	0.57	PIRVic estimate (FIS/IPMS)
Willows	<i>Salix x sepulcralis</i> ¹	0	0	0	0	0.100	0.85	PIRVic estimate
Spotted thistle	<i>Scolymus maculatus</i>	0	0	0	0	1.000	0.85	Gut Feel
Holly leaved senecio	<i>Senecio glastifolius</i>	0	0	0	0	0.100	1.00	Gut Feel
Athel pine, tamarisk	<i>Tamarix aphylla</i>	0	0	0	0	0.100	1.00	Gut Feel
Laurel clock vine	<i>Thunbergia laurifolia</i>	0	0	0	0	0.100	1.00	Gut Feel
Rosewood, tipuana tree	<i>Tipuana tipu</i>	0	0	0	0	0.100	1.00	Gut Feel
Subterranean Cape sedge	<i>Trianoptiles solitaria</i>	0	0	0	0	0.100	1.00	Gut Feel

¹ includes *S. x chrysocoma*



Noxious Weeds Review; Phase 3a species
East Gippsland CMA
Potential distribution by landuse and public land

Common name	Scientific name	Potential area* infested by landuse type						Potential total area
		Horticulture	Broadacre cropping	Forestry	Pasture dryland	Pasture irrigated	Public land	
Cutch tree	<i>Acacia catechu</i>	0	0	0	0	0	0	0
Prickly acacia	<i>Acacia nilotica</i>	0	0	0	211,300	7,602	872,300	1,091,202
Annual ragweed	<i>Ambrosia artemisiifolia</i>	9,285	0	0	256,217	7,602	11,473	284,577
Burr ragweed	<i>Ambrosia confertiflora</i>	0	0	0	202,590	7,602	3,502	213,694
Lacy ragweed	<i>Ambrosia tenuifolia</i>	0	0	0	256,517	0	11,473	267,990
Pond apple	<i>Annona glabra</i>	0	0	0	0	0	0	0
Madeira vine	<i>Anredera cordifolia</i>	0	0	700	0	0	1,800,900	1,801,600
Chinese violet	<i>Asystasia gangetica ssp. micrantha</i>	9,285	0	700	0	0	11,200	21,185
Barleria, porcupine flower	<i>Barleria prionitis</i>	0	0	0	0	0	0	0
Kochia	<i>Bassia scoparia</i>	0	0	0	256,517	0	6,800	263,317
Cabomba	<i>Cabomba caroliniana</i>	0	0	0	0	0	22,900	22,900
Heather	<i>Calluna vulgaris</i>	0	0	700	256,517	0	127,700	384,917
Greater bindweed	<i>Calystegia silvatica</i>	9,285	0	0	256,517	0	0	265,802
Glaucous star thistle	<i>Carthamus glaucus</i>	0	0	0	256,518	0	0	256,518
Spotted knapweed	<i>Centaurea maculosa</i>	0	0	0	256,517	7,602	14,400	278,519
Siam weed, chromolaena	<i>Chromolaena odorata</i>	0	0	0	0	0	0	0
Rubber vine	<i>Cryptostegia grandiflora</i>	0	0	0	0	0	0	0
Blue hound's tongue	<i>Cynoglossum creticum</i>	9,300	0	0	248,900	0	1,372,600	1,630,800
Cyperus	<i>Cyperus teneristolon</i>	0	0	0	0	6,066	49,635	55,701
African weed-orchid	<i>Disa bracteata</i>	0	0	0	256,517	7,602	1,198,381	1,462,500
False yellowhead	<i>Dittrichia viscosa</i>	0	0	0	256,517	7,602	24,830	288,949
Senegal tea plant	<i>Gymnocoronis spilanthoides</i>	0	0	0	0	7,602	38,100	45,702
English ivy	<i>Hedera helix</i>	0	0	640	0	0	1,763,210	1,763,850
Hymenachne, Olive hymenachne	<i>Hymenachne amplexicaulis</i>	0	0	0	0	0	0	0
Large flowered St John's wort	<i>Hypericum calycinum</i>	0	0	0	256,517	7,602	55,976	320,095
Canary Island St John's wort	<i>Hypericum canariense</i>	0	0	0	178,523	1,536	11,159	191,218
Trailing St John's wort	<i>Hypericum humifusum</i>	0	0	0	256,517	7,602	29,988	294,107
Chinese rain tree	<i>Koeleria elegans ssp. formosana</i>	0	0	0	0	0	0	0
Yellow Soldier	<i>Lachenalia reflexa</i>	0	0	0	0	0	0	0
Lantana	<i>Lantana camara</i>	0	0	700	256,517	7,602	851,800	1,116,619
Miconia	<i>Miconia spp.</i>	0	0	0	0	0	0	0
Mimosa, giant sensitive plant	<i>Mimosa pigra</i>	0	0	0	0	0	0	0
Thistle	<i>Onopordum dissectum</i>							N/A
Cotton thistle	<i>Onopordum nervosum</i>	0	0	0	135,286	0	1,908	137,194
Taurian thistle	<i>Onopordum tauricum</i>	0	0	0	29,694	0	39,732	69,426
Tiger pear	<i>Opuntia aurantiaca</i>	0	0	0	256,517	0	74,542	331,059
Parkinsonia	<i>Parkinsonia aculeata</i>	0	0	0	122,500	0	533,900	656,400
Garden geranium	<i>Pelargonium alchemilloides</i>	0	0	0	248,917	7,602	691,597	948,116
Leaf cactus	<i>Pereskia aculeata</i>	0	0	200	0	0	1,149,100	1,149,300
Uruguayan rice grass	<i>Piptochaetium montevidense</i>	0	0	0	138,500	0	14,100	152,600
Praxelis	<i>Praxelis clematidea</i>	0	0	0	0	0	0	0
White weeping broom	<i>Retama raetam</i>	0	0	0	106,429	0	4,336	110,765
Giant bramble	<i>Rubus alceifolius</i>	0	0	0	0	0	0	0
Florida blackberry	<i>Rubus argutus</i>	0	0	100	0	0	900,100	900,200
Keriberry	<i>Rubus rugosus</i>	0	0	0	0	0	448,031	448,031
Arrowhead	<i>Sagittaria montevidensis</i>	0	0	0	0	7,602	34,100	41,702
Delta arrowhead	<i>Sagittaria platyphylla</i>	0	0	0	0	7,602	34,100	41,702
Dwarf arrowhead	<i>Sagittaria pygmaea</i>	0	0	0	0	0	0	0
Willows	<i>Salix alba</i>	0	0	0	0	0	15,213	15,213
Willows	<i>Salix cinerea</i>	0	0	0	0	0	32,026	32,026
Willows	<i>Salix fragilis</i>	0	0	0	0	0	15,213	15,213
Willows	<i>Salix humboldtiana</i>	0	0	0	0	0	0	0
Willows	<i>Salix matsudana</i>	0	0	0	0	0	15,213	15,213
Willows	<i>Salix nigra</i>	0	0	0	0	0	12,165	12,165
Willows	<i>Salix purpurea</i>	0	0	0	0	0	15,213	15,213
Willows	<i>Salix viminalis</i>	0	0	0	0	0	15,213	15,213
Willows	<i>Salix x pendulina</i>	0	0	0	0	0	14,439	14,439
Willows	<i>Salix x rubens</i>	0	0	0	0	0	15,213	15,213
Willows	<i>Salix x sepulcralis</i> ¹	0	0	0	0	0	15,213	15,213
Spotted thistle	<i>Scolymus maculatus</i>	0	0	0	209,571	7,602	40,341	257,514
Holly leaved senecio	<i>Senecio glastifolius</i>	0	0	0	256,517	7,602	12,680	276,799
Athel pine, tamarisk	<i>Tamarix aphylla</i>	0	0	0	0	0	0	0
Laurel clock vine	<i>Thunbergia laurifolia</i>	0	0	0	0	0	0	0
Rosewood, tipuana tree	<i>Tipuana tipu</i>	0	0	0	0	0	0	0
Subterranean Cape sedge	<i>Trianoptiles solitaria</i>	0	0	0	0	0	403,574	403,574

*unit of measure is hectare

N/A = not available (too few data)

¹ includes *S. x chrysocoma*



Noxious Weeds Review; Phase 3a species
Glenelg Hopkins CMA
Regional score and rank

Scientific name	Common name	Inv. Score	Regional dist.	Impact Score	Regional score	Regional rank	Rank Relative to Phases 1&2
<i>Acacia catechu</i>	Cutch tree	0.6061	1.00	0.1080	0.4732	59	143
<i>Acacia nilotica</i>	Prickly acacia	0.5744	1.00	0.5345	0.7082	7	8
<i>Ambrosia artemisiifolia</i>	Annual ragweed	0.5760	1.00	0.2849	0.5687	38	64
<i>Ambrosia confertiflora</i>	Burr ragweed	0.5941	1.00	0.2267	0.5382	43	89
<i>Ambrosia tenuifolia</i>	Lacy ragweed	0.6041	1.00	0.1411	0.4915	57	130
<i>Annona glabra</i>	Pond apple	0.6948	1.00	0.2587	0.5682	39	66
<i>Anredera cordifolia</i>	Madeira vine	0.7660	0.85	0.3585	0.5817	33	57
<i>Asystasia gangetica</i> ssp. <i>micrantha</i>	Chinese violet	0.5931	0.85	0.2305	0.4893	58	134
<i>Barleria prionitis</i>	Barleria, porcupine flower	0.7002	1.00	0.1502	0.5081	53	116
<i>Bassia scoparia</i>	Kochia	0.6106	1.00	0.3563	0.6128	23	41
<i>Cabomba caroliniana</i>	Cabomba	0.6202	0.85	0.4813	0.6330	17	34
<i>Calluna vulgaris</i>	Heather	0.6742	1.00	0.2891	0.5828	32	56
<i>Calystegia silvatica</i>	Greater bindweed	0.3180	1.00	0.2593	0.5234	46	102
<i>Carthamus glaucus</i>	Glaucous star thistle	0.5168	1.00	0.3251	0.5841	31	55
<i>Centaurea maculosa</i>	Spotted knapweed	0.7544	1.00	0.5016	0.7114	6	7
<i>Chromolaena odorata</i>	Siam weed, chromolaena	0.7892	1.00	0.4469	0.6850	12	21
<i>Cryptostegia grandiflora</i>	Rubber vine	0.7574	1.00	0.4880	0.7042	9	10
<i>Cynoglossum creticum</i>	Blue hound's tongue	0.5987	1.00	0.2110	0.5300	44	97
<i>Cyperus teneristolon</i>	Cyperus	0.7330	0.71	0.2058	0.4446	63	156
<i>Disa bracteata</i>	African weed-orchid	0.7635	0.57	0.2567	0.4292	64	162
<i>Dittrichia viscosa</i>	False yellowhead	0.6756	1.00	0.2327	0.5514	42	82
<i>Gymnocoronis spilanthoides</i>	Senegal tea plant	0.4856	0.71	0.3575	0.4999	55	122
<i>Hedera helix</i>	English ivy	0.7455	0.42	0.3875	0.4493	62	154
<i>Hymenachne amplexicaulis</i>	Hymenachne, Olive hymenachne	0.6675	1.00	0.6456	0.7816	3	3
<i>Hypericum calycinum</i>	Large flowered St John's wort	0.5533	1.00	0.3388	0.5961	28	48
<i>Hypericum canariense</i>	Canary Island St John's wort	0.5055	1.00	0.2873	0.5616	40	70
<i>Hypericum humifusum</i>	Trailing St John's wort	0.4552	1.00	0.2088	0.5116	50	110
<i>Koeleruteria elegans</i> ssp. <i>formosana</i>	Chinese rain tree	0.5911	1.00	0.1677	0.5048	54	118
<i>Lachenalia reflexa</i>	Yellow Soldier	0.4270	0.85	0.3116	0.5147	49	108
<i>Lantana camara</i>	Lantana	0.6496	0.42	0.6372	0.5776	37	61
<i>Miconia</i> spp.	Miconia	0.8664	1.00	0.3037	0.6140	22	40
<i>Mimosa pigra</i>	Mimosa, giant sensitive plant	0.8180	1.00	0.3506	0.6345	16	32
<i>Onopordum dissectum</i>	Thistle	0.4312	1.00	0.3832	0.6063	26	45
<i>Onopordum nervosum</i>	Cotton thistle	0.5962	1.00	0.4685	0.6739	14	23
<i>Onopordum tauricum</i>	Taurian thistle	0.4682	1.00	0.3464	0.5902	29	49
<i>Opuntia aurantiaca</i>	Tiger pear	0.6516	1.00	0.6580	0.7867	2	2
<i>Parkinsonia aculeata</i>	Parkinsonia	0.6416	1.00	0.5568	0.7288	4	4
<i>Pelargonium alchemilloides</i>	Garden geranium	0.6058	1.00	0.3686	0.6191	21	39
<i>Pereskia aculeata</i>	Leaf cactus	0.7889	1.00	0.7331	0.8452	1	1
<i>Piptochaetium montevidense</i>	Uruguayan rice grass	0.7066	1.00	0.3544	0.6233	19	37
<i>Praxelis clematidea</i>	Praxelis	0.7051	1.00	0.3349	0.6121	24	42
<i>Retama raetam</i>	White weeping broom	0.6883	1.00	0.5053	0.7056	8	9
<i>Rubus alceifolius</i>	Giant bramble	0.6207	1.00	0.1977	0.5252	45	101
<i>Rubus argutus</i>	Florida blackberry	0.8084	1.00	0.4430	0.6851	11	20
<i>Rubus rugosus</i>	Keriberry	0.6752	0.57	0.4284	0.5148	48	107
<i>Sagittaria montevidensis</i>	Arrowhead	0.6835	0.71	0.4546	0.5780	35	59
<i>Sagittaria platyphylla</i>	Delta arrowhead	0.6835	0.71	0.4546	0.5780	35	59
<i>Sagittaria pygmaea</i>	Dwarf arrowhead	0.6835	1.00	0.4546	0.6766	13	22
<i>Salix alba</i>	Willows	0.5995	0.57	0.5951	0.5990	27	47
<i>Salix cinerea</i>	Willows	0.9190	0.71	0.6668	0.7251	5	5
<i>Salix fragilis</i>	Willows	0.5141	0.57	0.6283	0.6073	25	43
<i>Salix humboltiana</i>	Willows	0.5007	0.71	0.3397	0.4917	56	129
<i>Salix matsudana</i>	Willows	0.5980	0.71	0.3534	0.5110	51	112
<i>Salix nigra</i>	Willows	0.5656	0.71	0.5594	0.6225	20	38
<i>Salix purpurea</i>	Willows	0.7995	0.71	0.6302	0.6902	10	17
<i>Salix viminalis</i>	Willows	0.5605	0.71	0.4960	0.5864	30	54
<i>Salix x pendulina</i>	Willows	0.5864	0.71	0.2763	0.4665	61	149
<i>Salix x rubens</i>	Willows	0.6057	0.71	0.6283	0.6659	15	25
<i>Salix x sepulcralis</i> ¹	Willows	0.5920	0.71	0.3534	0.5103	52	113

Noxious Weeds Review; Phase 3a species
 Glenelg Hopkins CMA
 Regional score and rank

Scientific name	Common name	Inv. Score	Regional dist.	Impact Score	Regional score	Regional rank	Rank Relative to Phases 1&2
<i>Scolymus maculatus</i>	Spotted thistle	0.7940	1.00	0.2136	0.5549	41	78
<i>Senecio glastifolius</i>	Holly leaved senecio	0.5973	1.00	0.3018	0.5807	34	58
<i>Tamarix aphylla</i>	Athel pine, tamarisk	0.6738	0.71	0.3558	0.5215	47	103
<i>Thunbergia laurifolia</i>	Laurel clock vine	0.4405	1.00	0.4150	0.6253	18	36
<i>Tipuana tipu</i>	Rosewood, tipuana tree	0.4541	1.00	0.1403	0.4731	60	144
<i>Trianoptiles solitaria</i>	Subterranean Cape sedge	0.5107	0.57	0.1887	0.3607	65	175

* includes *S. x chrysocoma*



Noxious Weeds Review; Phase 3a species
Glenelg Hopkins CMA
Ranked relative to Phase 1 & 2 (highlighted in red)

Scientific name	Common name	Invasiveness Score	Regional Dist	Impact Scores	Final Score	RANK
<i>Pereskia aculeata</i>	Leaf cactus	0.788886	1.00	0.733119	0.845213	1
<i>Opuntia aurantiaca</i>	Tiger pear	0.651556	1.00	0.657976	0.786653	2
<i>Hymenachne amplexicaulis</i>	Hymenachne, Olive hymenachne	0.667534	1.00	0.645600	0.781640	3
<i>Parkinsonia aculeata</i>	Parkinsonia	0.641562	1.00	0.556809	0.728801	4
<i>Salix cinerea</i>	Willows	0.919002	0.71	0.666778	0.725076	5
<i>Eichhornia crassipes</i>	Water Hyacinth	0.879335	1	0.527622	0.720989	6
<i>Centaurea maculosa</i>	Spotted knapweed	0.754357	1.00	0.501646	0.711445	7
<i>Acacia nilotica</i>	Prickly acacia	0.574417	1.00	0.534471	0.708234	8
<i>Retama raetam</i>	White weeping broom	0.688328	1.00	0.505316	0.705576	9
<i>Cryptostegia grandiflora</i>	Rubber vine	0.757375	1.00	0.488003	0.704167	10
<i>Orobanche ramosa</i>	Branched Broomrape	0.769900	1	0.519638	0.703385	11
<i>Pennisetum macrourum</i>	African Feather Grass	0.612026	0.85	0.627185	0.696667	12
<i>Acacia erioloba</i>	Giraffe thorn	0.700000	1	0.519638	0.694997	13
<i>Hieracium</i> spp.	Hawkweeds	0.700000	1	0.519638	0.694997	13
<i>Nassella tenuissima</i>	Mexican feather grass	0.700000	1	0.519638	0.694997	13
<i>Acacia karroo</i>	Karoo thorn	0.670000	1	0.519638	0.691397	16
<i>Salix purpurea</i>	Willows	0.799511	0.71	0.630180	0.690242	17
<i>Nassella charruana</i>	Lobed needle grass	0.650000	1	0.519638	0.688997	18
<i>Salvinia molesta</i>	Salvinia	0.587464	1	0.529090	0.686786	19
<i>Rubus argutus</i>	Florida blackberry	0.808417	1.00	0.442982	0.685080	20
<i>Chromolaena odorata</i>	Siam weed, chromolaena	0.789234	1.00	0.446929	0.684988	21
<i>Sagittaria pygmaea</i>	Dwarf arrowhead	0.683469	1.00	0.454599	0.676592	22
<i>Onopordum nervosum</i>	Cotton thistle	0.596175	1.00	0.468505	0.673904	23
<i>Fallopia japonica</i> , <i>Fallopia sachalinensis</i>	Japanese and Giant knotweed	0.506400	1	0.519638	0.671765	24
<i>Salix x rubens</i>	Willows	0.605670	0.71	0.628311	0.665935	25
<i>Parthenium hysterophorus</i>	Parthenium Weed	0.825166	1	0.420087	0.654269	26
<i>Nassella trichotoma</i>	Serrated Tussock	0.761536	0.57	0.675277	0.651939	27
<i>Equisetum</i> spp.	Horsetails	0.726000	0.85	0.519638	0.650117	28
<i>Alternanthera philoxeroides</i>	Alligator Weed	0.527352	0.57	0.719621	0.648670	29
<i>Prosopis</i> spp.	Mesquite	0.658431	0.85	0.521093	0.642824	30
<i>Iva axillaris</i>	Poverty Weed	0.538501	1	0.453036	0.638320	31
<i>Mimosa pigra</i>	Mimosa, giant sensitive plant	0.818008	1.00	0.350578	0.634484	32
<i>Rubus fruticosus</i> agg.	Blackberry	0.767146	0.42	0.726464	0.633277	33
<i>Cabomba caroliniana</i>	Cabomba	0.620155	0.85	0.481313	0.632954	34
<i>Xanthium spinosum</i>	Noogoora Burr/ Californian Burr	0.619536	0.85	0.500315	0.626521	35
<i>Thunbergia laurifolia</i>	Laurel clock vine	0.440524	1.00	0.415005	0.625266	36
<i>Piptochaetium montevidense</i>	Uruguayan rice grass	0.706617	1.00	0.354400	0.623258	37
<i>Salix nigra</i>	Willows	0.565578	0.71	0.559364	0.622513	38
<i>Pelargonium alchemilloides</i>	Garden geranium	0.605828	1.00	0.368643	0.619139	39
<i>Miconia</i> spp.	Miconia	0.866385	1.00	0.303706	0.614041	40
<i>Bassia scoparia</i>	Kochia	0.610614	1.00	0.356267	0.612783	41
<i>Praxelis clematidea</i>	Praxelis	0.705095	1.00	0.334863	0.612135	42
<i>Salix fragilis</i>	Willows	0.514090	0.57	0.628311	0.607345	43
<i>Convolvulus arvensis</i>	Bindweed	0.779101	0.85	0.430366	0.606497	44
<i>Onopordum dissectum</i>	Thistle	0.431190	1.00	0.383170	0.606318	45
<i>Echium vulgare</i>	Viper's Bugloss	0.655865	0.85	0.446556	0.600775	46
<i>Salix alba</i>	Willows	0.599482	0.57	0.595056	0.598969	47
<i>Hypericum calycinum</i>	Large flowered St John's wort	0.553290	1.00	0.338782	0.596113	48
<i>Onopordum tauricum</i>	Taurian thistle	0.468246	1.00	0.346370	0.590157	49
<i>Lagarosiphon major</i>	Lagarosiphon	0.649037	1	0.342517	0.589694	50
<i>Hemeria flaccida</i>	Cape Tulip (two-leaf)	0.684162	0.85	0.417379	0.587832	51
<i>Centaurea solstitialis</i>	St. Barnaby's Thistle	0.655091	0.85	0.423400	0.587715	52
<i>Ulex europaeus</i>	Furze/Gorse	0.828248	0.57	0.545087	0.587038	53
<i>Salix viminalis</i>	Willows	0.560486	0.71	0.495981	0.586408	54
<i>Carthamus glaucus</i>	Glaucous star thistle	0.516750	1.00	0.325102	0.584067	55
<i>Calluna vulgaris</i>	Heather	0.674172	1.00	0.289081	0.582786	56
<i>Anredera cordifolia</i>	Madeira vine	0.766046	0.85	0.358456	0.581661	57
<i>Senecio glastifolius</i>	Holly leaved senecio	0.597307	1.00	0.301771	0.580669	58
<i>Sagittaria montevidensis</i>	Arrowhead	0.683469	0.71	0.454599	0.577992	59
<i>Sagittaria platyphylla</i>	Delta arrowhead	0.683469	0.71	0.454599	0.577992	59
<i>Lantana camara</i>	Lantana	0.649647	0.42	0.637247	0.577616	61
<i>Acroptilon repens</i>	Hardheads/Russian Knapweed	0.514006	0.85	0.434553	0.577030	62
<i>Nassella neesiana</i>	Chilean needle grass	0.686622	0.57	0.543816	0.569332	63
<i>Ambrosia artemisiifolia</i>	Annual ragweed	0.575985	1.00	0.284903	0.568664	64
<i>Cirsium arvense</i>	Californian/Perennial Thistle	0.702729	0.71	0.458673	0.568385	65
<i>Annona glabra</i>	Pond apple	0.694802	1.00	0.258663	0.568228	66
<i>Hemeria miniata</i>	Cape Tulip (one-leaf)	0.747658	0.71	0.440860	0.563800	67
<i>Rosa rubiginosa</i>	Sweet Briar	0.793721	0.57	0.508953	0.562660	68

Noxious Weeds Review; Phase 3a species
Glenelg Hopkins CMA
Ranked relative to Phase 1 & 2 (highlighted in red)

Scientific name	Common name	Invasiveness Score	Regional Dist	Impact Scores	Final Score	RANK
<i>Cytisus scoparius</i>	English Broom	0.734874	0.57	0.520938	0.562310	69
<i>Hypericum canariense</i>	Canary Island St John's wort	0.505525	1.00	0.287333	0.561570	70
<i>Onopordum illyricum</i>	Illyrian Thistle	0.533147	0.85	0.401999	0.561097	71
<i>Datura ferox</i>	Thorn Apple (common)	0.703633	0.71	0.444751	0.560697	72
<i>Datura stramonium</i>	Thorn Apple (longspine)	0.703600	0.71	0.444751	0.560693	73
<i>Datura innoxia</i>	Thorn Apple (recurved)	0.703600	0.71	0.444751	0.560693	73
<i>Alhagi maurorum</i>	Camelthorn	0.569959	0.85	0.386286	0.556715	75
<i>Cuscuta</i> spp.	Dodder	0.734033	0.71	0.429397	0.555746	76
<i>Hypericum triquetrifolium</i>	Tangled Hypericum	0.602251	0.85	0.377231	0.555520	77
<i>Scolymus maculatus</i>	Spotted thistle	0.794014	1.00	0.213592	0.554893	78
<i>Cannabis sativa</i>	Marijuana	0.565385	1	0.297461	0.554424	79
<i>Onopordum acanthium</i>	Scotch/Heraldic Thistle	0.571238	0.85	0.381627	0.554260	80
<i>Allium triquetrum</i>	Angled Onion	0.614461	0.71	0.448094	0.551868	81
<i>Dittrichia viscosa</i>	False yellowhead	0.675616	1.00	0.232653	0.551360	82
<i>Tribulus terrestris</i>	Caltrop	0.606654	0.85	0.368584	0.551205	83
<i>Festuca gautieri</i>	bearskin fescue	0.491440	0.85	0.387816	0.548150	84
<i>Amsinckia</i> spp.	Amsinckia	0.745464	0.85	0.333240	0.548070	85
<i>Salpichroa origanifolia</i>	Pampas Lily-of-the-Valley	0.762638	0.85	0.320066	0.542753	86
<i>Opuntia robusta</i>	Wheel Cactus	0.645158	0.85	0.345016	0.542628	87
<i>Senecio pterophorus</i>	African Daisy	0.676556	0.85	0.337358	0.542107	88
<i>Ambrosia confertiflora</i>	Burr ragweed	0.594088	1.00	0.226697	0.538241	89
<i>Chondrilla juncea</i>	Skeleton Weed	0.742382	0.85	0.315662	0.537856	90
<i>Ailanthus altissima</i>	Tree of Heaven	0.895314	0.57	0.441183	0.536900	91
<i>Cardaria draba</i>	Hoary Cress	0.563497	0.71	0.429138	0.535137	92
<i>Ambrosia psilostachya</i>	Perennial Ragweed	0.489293	0.85	0.364356	0.534755	93
<i>Eragrostis curvula</i>	African Lovegrass	0.715330	0.85	0.314456	0.533935	94
<i>Opuntia stricta</i>	Prickly Pear (drooping)	0.552003	0.85	0.345016	0.531449	95
<i>Lavandula stoechas</i>	Topped Lavender	0.682210	0.85	0.316423	0.531062	96
<i>Cynoglossum creticum</i>	Blue hound's tongue	0.598661	1.00	0.210974	0.529985	97
<i>Marrubium vulgare</i>	Horehound	0.771737	0.57	0.451853	0.528046	98
<i>Lycium ferocissimum</i>	Boxthorn	0.674957	0.57	0.470710	0.526993	99
<i>Centaurea nigra</i>	Black Knapweed	0.641607	0.85	0.317275	0.526667	100
<i>Rubus alceifolius</i>	Giant bramble	0.620743	1.00	0.197677	0.525188	101
<i>Calystegia silvatica</i>	Greater bindweed	0.317991	1.00	0.259324	0.523380	102
<i>Tamarix aphylla</i>	Athel pine, tamarisk	0.673811	0.71	0.355786	0.521497	103
<i>Alternanthera pungens</i>	Khaki Weed	0.653479	0.85	0.303604	0.520436	104
<i>Cytisus multiflorus</i>	white Spanish broom	0.517034	0.85	0.330775	0.519278	105
<i>Cestrum parqui</i>	Chilean Cestrum	0.727801	0.71	0.358471	0.515280	106
<i>Rubus rugosus</i>	Keriberry	0.675226	0.57	0.428443	0.514755	107
<i>Lachenalia reflexa</i>	Yellow Soldier	0.426976	0.85	0.311622	0.514746	108
<i>Conium maculatum</i>	Hemlock	0.665290	0.57	0.446703	0.512388	109
<i>Hypericum humifusum</i>	Trailing St John's wort	0.455230	1.00	0.208817	0.511565	110
<i>Opuntia vulgaris</i>	Prickly Pear (erect)	0.759228	0.71	0.345016	0.511516	111
<i>Salix matsudana</i>	Willows	0.598025	0.71	0.353359	0.511044	112
<i>Salix x sepulcralis</i>¹	Willows	0.592031	0.71	0.353359	0.510325	113
<i>Sagittaria graminea</i>	Arrowhead	0.586551	0.85	0.298489	0.509540	114
<i>Sida leprosa</i>	Ivy-leaved Sida	0.485639	1	0.234041	0.509339	115
<i>Barleria prionitis</i>	Barleria, porcupine flower	0.700199	1.00	0.150169	0.508118	116
<i>Solanum elaeagnifolium</i>	Silverleaf Nightshade	0.667968	0.71	0.357925	0.507794	117
<i>Koeleruteria elegans</i> ssp. <i>formos</i>	Chinese rain tree	0.591073	1.00	0.167702	0.504842	118
<i>Calicotome spinosa</i>	Spiny Broom	0.447135	0.85	0.317558	0.503489	119
<i>Crataegus monogyna</i>	Hawthorn	0.704590	0.42	0.506902	0.502816	120
<i>Spartium junceum</i>	Spanish broom	0.341815	0.85	0.33587	0.501105	121
<i>Gymnocoronis spilanthoides</i>	Senegal tea plant	0.485586	0.71	0.357542	0.499894	122
<i>Scolymus hispanicus</i>	Golden Thistle	0.497723	0.71	0.377717	0.498448	123
<i>Hypericum tetrapterum</i>	St. Peter's Wort	0.552896	0.85	0.284303	0.497557	124
<i>Cenchrus longispinus</i>	Spiny Burr Grass/ Gentle Annie	0.402417	0.85	0.313125	0.495640	125
<i>Onopordum acaulon</i>	Stemless Thistle	0.528267	0.85	0.285015	0.495001	126
<i>Cynara cardunculus</i>	Artichoke Thistle	0.662745	0.57	0.413264	0.493358	127
<i>Echium plantagineum</i>	Paterson's Curse	0.665066	0.57	0.412722	0.493332	128
<i>Salix humboltiana</i>	Willows	0.500663	0.71	0.339666	0.491693	129
<i>Ambrosia tenuifolia</i>	Lacy ragweed	0.604084	1.00	0.141134	0.491525	130
<i>Silybum marianum</i>	Variegated Thistle	0.765111	0.57	0.387726	0.491340	131
<i>Centaurea calcitrapa</i>	Star Thistle	0.408196	0.85	0.303943	0.491192	132
<i>Juncus acutus</i>	Spiny Rush	0.516930	0.57	0.438554	0.490022	133
<i>Asystasia gangetica</i> ssp. <i>micram</i>	Chinese violet	0.593129	0.85	0.230522	0.489268	134
<i>Carduus nutans</i>	Nodding Thistle	0.390918	0.85	0.302426	0.488269	135
<i>Physalis viscosa</i>	Prairie Ground Cherry	0.727781	0.71	0.309365	0.487778	136

Noxious Weeds Review; Phase 3a species
Glenelg Hopkins CMA
Ranked relative to Phase 1 & 2 (highlighted in red)

Scientific name	Common name	Invasiveness Score	Regional Dist	Impact Scores	Final Score	RANK
<i>Genista linifolia</i>	Flax Leaved Broom	0.703726	0.57	0.392163	0.486458	137
<i>Nassella hyalina</i>	cane needle grass	0.503576	0.85	0.267807	0.482401	138
<i>Ibicella lutea</i>	Devil's Claw (yellowflower)	0.616016	0.85	0.241384	0.481097	139
<i>Asparagus asparagoides</i>	bridal creeper	0.782848	0.57	0.361907	0.479010	140
<i>Emex australis</i>	Spiny Emex	0.535113	0.85	0.247396	0.474755	141
<i>Cirsium acarna</i>	Soldier Thistle	0.523968	0.85	0.249563	0.474632	142
<i>Acacia catechu</i>	Cutch tree	0.606058	1.00	0.107969	0.473190	143
<i>Tipuana tipu</i>	Rosewood, tipuana tree	0.454073	1.00	0.140342	0.473080	144
<i>Proboscidea louisianica</i>	Devil's Claw (purpleflower)	0.542172	0.85	0.241384	0.472236	145
<i>Hypericum androsaemum</i>	Tutsan	0.746650	0.71	0.276452	0.471611	146
<i>Solanum rostratum</i>	Buffalo Burr	0.468698	0.85	0.254399	0.470707	147
<i>Carthamus lanatus</i>	Saffron Thistle	0.499430	0.57	0.405518	0.469422	148
<i>Salix x pendulina</i>	Willows	0.586438	0.71	0.276310	0.466506	149
<i>Carduus tenuiflorus</i> / <i>C. pycnocephalus</i>	Slender/Shore Thistle	0.608219	0.57	0.359060	0.456460	150
<i>Pittosporum undulatum</i>	sweet pittosporum	0.793704	0.57	0.315117	0.454110	151
<i>Genista monspessulana</i>	Cape Broom /Montpellier Broom	0.698418	0.42	0.419839	0.453320	152
<i>Xanthium strumarium</i>	Bathurst Burr	0.585163	0.57	0.356250	0.452120	153
<i>Hedera helix</i>	English ivy	0.745474	0.42	0.387495	0.449254	154
<i>Hypericum perforatum</i>	St. John's Wort	0.660601	0.57	0.334271	0.448864	155
<i>Cyperus teneristolon</i>	Cyperus	0.732975	0.71	0.205759	0.444582	156
<i>Leucanthemum vulgare</i>	Ox-eye Daisy	0.610238	0.57	0.333108	0.442169	157
<i>Chrysanthemoides monilifera</i>	Boneseed/Bitou Bush	0.799614	0.42	0.375091	0.440405	158
<i>Nassella leucotricha</i>	Texas needle grass	0.627929	0.57	0.326146	0.440393	159
<i>Dittrichia graveolens</i>	Stinkwort	0.607585	0.57	0.319717	0.434352	160
<i>Senecio jacobaea</i>	Ragwort	0.776347	0.42	0.363784	0.431281	161
<i>Disa bracteata</i>	African weed-orchid	0.763497	0.57	0.256714	0.429179	162
<i>Vinca major</i>	blue periwinkle	0.703021	0.57	0.289181	0.428704	163
<i>Dipsacus fullonum</i>	Wild Teasel	0.551563	0.57	0.309552	0.421937	164
<i>Allium vineale</i>	Wild Garlic	0.658241	0.57	0.285822	0.421449	165
<i>Melianthus comosus</i>	Tufted Honeyflower	0.492463	0.42	0.394016	0.414144	166
<i>Solanum linnaeanum</i>	Apple of Sodom	0.356227	0.57	0.325025	0.407161	167
<i>Verbascum thapsus</i>	Great Mullein	0.474171	0.57	0.296038	0.405082	168
<i>Watsonia meriana</i> 'Bulbillifera'	Wild Watsonia	0.402004	0.57	0.307647	0.402923	169
<i>Foeniculum vulgare</i>	Fennel	0.574220	0.42	0.326980	0.386415	170
<i>Oxalis pes-caprae</i>	Soursob	0.743995	0.28	0.365451	0.383532	171
<i>Asphodelus fistulosus</i>	Onion Weed	0.539790	0.42	0.328848	0.383330	172
<i>Diplotaxis tenuifolia</i>	Sand Rocket/Sand Mustard	0.565974	0.42	0.317803	0.380286	173
<i>Cirsium vulgare</i>	Spear Thistle	0.693549	0.28	0.353660	0.370875	174
<i>Trianoptiles solitaria</i>	Subterranean Cape sedge	0.510665	0.57	0.188664	0.360732	175
<i>Reseda luteola</i>	Wild Mignonette	0.537021	0.57	0.167145	0.340444	176



Noxious Weeds Review; Phase 3a species
Glenelg Hopkins CMA
Present distribution and calculation of potential distribution score

Common name	Scientific name	IPMS	area of infestation (ha)	FIS	Regional Estimate		Weight	Estimate based on: regional description, present potential ratio or gut feeling
		# infestations		# infestations	# infestations	area of infestation		
Cutch tree	<i>Acacia catechu</i>	0	0	0		0.100	1.00	PIRVic estimate
Prickly acacia	<i>Acacia nilotica</i>	0	0	0		0.100	1.00	PIRVic estimate
Annual ragweed	<i>Ambrosia artemisiifolia</i>	0	0	0		1.000	1.00	PIRVic estimate
Burr ragweed	<i>Ambrosia confertiflora</i>	0	0	0		1.000	1.00	PIRVic estimate
Lacy ragweed	<i>Ambrosia tenuifolia</i>	0	0	0		1.000	1.00	PIRVic estimate
Pond apple	<i>Annona glabra</i>	0	0	0		0.100	1.00	PIRVic estimate
Madeira vine	<i>Anredera cordifolia</i>	0	0	1		1.000	0.85	PIRVic estimate
Chinese violet	<i>Asystasia gangetica ssp. Micrantha</i>	0	0	0		0.100	0.85	PIRVic estimate
Barleria, porcupine flower	<i>Barleria prionitis</i>	0	0	0		0.100	1.00	PIRVic estimate
Kochia	<i>Bassia scoparia</i>	0	0	0		0.100	1.00	PIRVic estimate
Cabomba	<i>Cabomba caroliniana</i>	0	0	0		0.100	0.85	PIRVic estimate
Heather	<i>Calluna vulgaris</i>	0	0	0		0.100	1.00	PIRVic estimate
Greater bindweed	<i>Calystegia silvatica</i>	0	0	3		1.000	1.00	PIRVic estimate
Glaucous star thistle	<i>Carthamus glaucus</i>	0	0	0		1.000	1.00	PIRVic estimate
Spotted knapweed	<i>Centaurea maculosa</i>	0	0	0		1.000	1.00	PIRVic estimate
Siam weed, chromolaena	<i>Chromolaena odorata</i>	0	0	0		0.100	1.00	PIRVic estimate
Rubber vine	<i>Cryptostegia grandiflora</i>	0	0	0		0.100	1.00	PIRVic estimate
Blue hound's tongue	<i>Cynoglossum creticum</i>	0	0	0		1.000	1.00	PIRVic estimate
Cyperus	<i>Cyperus teneristolon</i>	0	0	0		1.000	0.71	PIRVic estimate
African weed-orchid	<i>Disa bracteata</i>	12	17	10	30	1,000.000	0.57	Regional estimate
False yellowhead	<i>Dittrichia viscosa</i>	0	0	0		1.000	1.00	PIRVic estimate
Senegal tea plant	<i>Gymnocoronis spilanthoides</i>	0	0	0	0	1.000	0.71	Regional estimate
English ivy	<i>Hedera helix</i>	1	10	3	12	20.000	0.42	Regional/PIRVic estimate
Hymenachne, Olive hymenachne	<i>Hymenachne amplexicaulis</i>	0	0	0		0.100	1.00	PIRVic estimate
Large flowered St John's wort	<i>Hypericum calycinum</i>	0	0	0		1.000	1.00	PIRVic estimate
Canary Island St John's wort	<i>Hypericum canariense</i>	0	0	0		1.000	1.00	PIRVic estimate
Trailing St John's wort	<i>Hypericum humifusum</i>	0	0	0		1.000	1.00	PIRVic estimate
Chinese rain tree	<i>Koelreuteria elegans ssp. formosana</i>	0	0	0		0.000	1.00	PIRVic estimate
Yellow Soldier	<i>Lachenalia reflexa</i>	0	0	0		1.000	0.85	PIRVic estimate
Lantana	<i>Lantana camara</i>	0	0	0		1.000	0.42	PIRVic estimate
Miconia	<i>Miconia spp.</i>	0	0	0		0.000	1.00	PIRVic estimate
Mimosa, giant sensitive plant	<i>Mimosa pigra</i>	0	0	0		0.100	1.00	PIRVic estimate
Thistle	<i>Onopordum dissectum</i>	0	0	0		0.000	1.00	PIRVic estimate
Cotton thistle	<i>Onopordum nervosum</i>	0	0	0		1.000	1.00	PIRVic estimate
Taurian thistle	<i>Onopordum tauricum</i>	0	0	0		1.000	1.00	PIRVic estimate
Tiger pear	<i>Opuntia aurantiaca</i>	0	0	0		1.000	1.00	PIRVic estimate
Parkinsonia	<i>Parkinsonia aculeata</i>	0	0	0		0.100	1.00	PIRVic estimate
Garden geranium	<i>Pelargonium alchemilloides</i>	0	0	0		1.000	1.00	PIRVic estimate
Leaf cactus	<i>Pereskia aculeata</i>	0	0	0		0.000	1.00	PIRVic estimate
Uruguayan rice grass	<i>Piptochaetium montevidense</i>	0	0	0		1.000	1.00	PIRVic estimate
Praxelis	<i>Praxelis clematidea</i>	0	0	0		0.000	1.00	PIRVic estimate
White weeping broom	<i>Retama raetam</i>	0	0	0		1.000	1.00	PIRVic estimate
Giant bramble	<i>Rubus alceifolius</i>	0	0	0		0.000	1.00	PIRVic estimate
Florida blackberry	<i>Rubus argutus</i>	0	0	0		0.000	1.00	PIRVic estimate
Keriberry	<i>Rubus rugosus</i>	0	0	0		1.000	0.57	PIRVic estimate
Arrowhead	<i>Sagittaria montevidensis</i>	0	0	0		1.000	0.71	PIRVic estimate
Delta arrowhead	<i>Sagittaria platyphylla</i>	0	0	0		1.000	0.71	PIRVic estimate
Dwarf arrowhead	<i>Sagittaria pygmaea</i>	0	0	0		0.000	1.00	PIRVic estimate
Willows	<i>Salix alba</i>	0	0	4		4.000	0.57	PIRVic estimate (FIS)
Willows	<i>Salix cinerea</i>	0	0	1		1.000	0.71	PIRVic estimate (FIS)
Willows	<i>Salix fragilis</i>	0	0	1		1.000	0.57	PIRVic estimate (FIS)
Willows	<i>Salix humboldtiana</i>	0	0	0		0.100	0.71	PIRVic estimate (FIS)
Willows	<i>Salix matsudana</i>	0	0	0		0.100	0.71	PIRVic estimate (FIS)
Willows	<i>Salix nigra</i>	0	0	0		0.100	0.71	PIRVic estimate (FIS)
Willows	<i>Salix purpurea</i>	0	0	0		0.100	0.71	PIRVic estimate (FIS)
Willows	<i>Salix viminalis</i>	0	0	0		0.100	0.71	PIRVic estimate (FIS)
Willows	<i>Salix x pendulina</i>	0	0	0		0.100	0.71	PIRVic estimate (FIS)
Willows	<i>Salix x rubens</i>	0	0	0		0.100	0.71	PIRVic estimate (FIS)
Willows	<i>Salix x sepulcralis</i> ¹	0	0	0		0.100	0.71	PIRVic estimate (FIS)
Spotted thistle	<i>Scolymus maculatus</i>	0	0	0		1.000	1.00	PIRVic estimate
Holly leaved senecio	<i>Senecio glastifolius</i>	0	0	0		1.000	1.00	PIRVic estimate
Athel pine, tamarisk	<i>Tamarix aphylla</i>	0	0	0		0.100	0.71	PIRVic estimate
Laurel clock vine	<i>Thunbergia laurifolia</i>	0	0	0		0.100	1.00	PIRVic estimate
Rosewood, tipuana tree	<i>Tipuana tipu</i>	0	0	0		0.100	1.00	PIRVic estimate
Subterranean Cape sedge	<i>Trianoptiles solitaria</i>	0	0	0		1.000	0.57	PIRVic estimate

¹ includes *S. x chrysocoma*

Noxious Weeds Review; Phase 3a species
Glenelg Hopkins CMA
Potential distribution by landuse and public land

Common name	Scientific name	Potential area* infested by landuse type						Potential total area
		Horticulture	Broadacre cropping	Forestry	Pasture dryland	Pasture irrigated	Public land	
Cutch tree	<i>Acacia catechu</i>	0	0	0	0	0	0	0
Prickly acacia	<i>Acacia nilotica</i>	0	0	0	1,649,000	254	127,200	1,776,454
Annual ragweed	<i>Ambrosia artemisiifolia</i>	10,907	0	0	2,171,012	254	54,195	2,236,368
Burr ragweed	<i>Ambrosia confertiflora</i>	0	0	0	2,171,012	254	89,437	2,260,703
Lacy ragweed	<i>Ambrosia tenuifolia</i>	0	0	0	2,171,012	0	54,195	2,225,207
Pond apple	<i>Annona glabra</i>	0	0	0	0	0	0	0
Madeira vine	<i>Anredera cordifolia</i>	0	0	49,600	0	0	257,400	307,000
Chinese violet	<i>Asystasia gangetica ssp. micrantha</i>	10,907	0	8,100	0	0	6,900	25,907
Barleria, porcupine flower	<i>Barleria prionitis</i>	0	0	0	0	0	0	0
Kochia	<i>Bassia scoparia</i>	0	0	0	2,171,012	0	54,200	2,225,212
Cabomba	<i>Cabomba caroliniana</i>	0	0	0	0	0	79,300	79,300
Heather	<i>Calluna vulgaris</i>	0	0	33,300	1,705,600	0	120,500	1,859,400
Greater bindweed	<i>Calystegia silvatica</i>	10,907	0	0	2,171,012	0	0	2,181,919
Glaucous star thistle	<i>Carthamus glaucus</i>	0	0	0	2,171,012	0	254	2,171,266
Spotted knapweed	<i>Centaurea maculosa</i>	0	0	0	2,171,012	254	45,400	2,216,666
Siam weed, chromolaena	<i>Chromolaena odorata</i>	0	0	0	0	0	0	0
Rubber vine	<i>Cryptostegia grandiflora</i>	0	0	0	0	0	0	0
Blue hound's tongue	<i>Cynoglossum creticum</i>	10,907	0	0	2,118,400	0	255,100	2,384,407
Cyperus	<i>Cyperus teneristolon</i>	10,907	0	0	0	254	8,508	19,669
African weed-orchid	<i>Disa bracteata</i>	0	0	0	2,171,012	254	284,799	2,456,065
False yellowhead	<i>Dittrichia viscosa</i>	0	0	0	2,171,012	254	49,588	2,220,854
Senegal tea plant	<i>Gymnocoronis spilanthoides</i>	0	0	0	0	254	82,100	82,354
English ivy	<i>Hedera helix</i>	0	0	49,587	0	0	490,849	540,436
Hymenachne, Olive hymenachne	<i>Hymenachne amplexicaulis</i>	0	0	0	1,662,520	0	59,284	1,721,804
Large flowered St John's wort	<i>Hypericum calycinum</i>	0	0	0	2,171,012	254	148,466	2,319,732
Canary Island St John's wort	<i>Hypericum canariense</i>	0	0	0	2,171,012	254	54,195	2,225,461
Trailing St John's wort	<i>Hypericum humifusum</i>	0	0	0	2,171,012	254	305,211	2,476,477
Chinese rain tree	<i>Koelreuteria elegans ssp. formosana</i>	0	0	0	0	0	0	0
Yellow Soldier	<i>Lachenalia reflexa</i>	0	0	0	730,638	0	240,755	971,393
Lantana	<i>Lantana camara</i>	0	0	49,600	2,171,012	300	417,300	2,638,212
Miconia	<i>Miconia spp.</i>	0	0	0	0	0	0	0
Mimosa, giant sensitive plant	<i>Mimosa pigra</i>	0	0	0	0	0	0	0
Thistle	<i>Onopordum dissectum</i>							N/A
Cotton thistle	<i>Onopordum nervosum</i>	10,907	0	0	2,118,421	0	261,569	2,390,897
Taurian thistle	<i>Onopordum tauricum</i>	0	0	0	2,171,012	254	305,828	2,477,094
Tiger pear	<i>Opuntia aurantiaca</i>	0	0	0	2,171,012	0	346,262	2,517,274
Parkinsonia	<i>Parkinsonia aculeata</i>	0	0	0	465,400	0	88,700	554,100
Garden geranium	<i>Pelargonium alchemilloides</i>	0	0	0	2,171,012	254	226,274	2,397,540
Leaf cactus	<i>Pereskia aculeata</i>	0	0	0	0	0	0	0
Uruguayan rice grass	<i>Piptochaetium montevidense</i>	0	0	0	2,171,012	0	45,400	2,216,412
Praxelis	<i>Praxelis clematidea</i>	0	0	0	0	0	0	0
White weeping broom	<i>Retama raetam</i>	0	0	0	2,171,012	0	148,466	2,319,478
Giant bramble	<i>Rubus alceifolius</i>	0	0	0	0	0	0	0
Florida blackberry	<i>Rubus argutus</i>	0	0	0	0	0	0	0
Keriberry	<i>Rubus rugosus</i>	0	0	0	0	0	8,058	8,058
Arrowhead	<i>Sagittaria montevidensis</i>	0	0	0	0	254	79,300	79,554
Delta arrowhead	<i>Sagittaria platyphylla</i>	0	0	0	0	254	79,300	79,554
Dwarf arrowhead	<i>Sagittaria pygmaea</i>	0	0	0	0	0	0	0
Willows	<i>Salix alba</i>	0	0	0	0	0	3,197	3,197
Willows	<i>Salix cinerea</i>	0	0	0	0	0	75,033	75,033
Willows	<i>Salix fragilis</i>	0	0	0	0	0	3,197	3,197
Willows	<i>Salix humboldtiana</i>	0	0	0	0	0	2,585	2,585
Willows	<i>Salix matsudana</i>	0	0	0	0	0	3,197	3,197
Willows	<i>Salix nigra</i>	0	0	0	0	0	3,197	3,197
Willows	<i>Salix purpurea</i>	0	0	0	0	0	3,197	3,197
Willows	<i>Salix viminalis</i>	0	0	0	0	0	3,197	3,197
Willows	<i>Salix x pendulina</i>	0	0	0	0	0	3,197	3,197
Willows	<i>Salix x rubens</i>	0	0	0	0	0	3,197	3,197
Willows	<i>Salix x sepulcralis</i> ¹	0	0	0	0	0	3,197	3,197
Spotted thistle	<i>Scolymus maculatus</i>	0	0	0	1,122,165	0	45,340	1,167,505
Holly leaved senecio	<i>Senecio glastifolius</i>	0	0	0	2,171,012	254	9,618	2,180,884
Athel pine, tamarisk	<i>Tamarix aphylla</i>	0	0	0	0	0	3,197	3,197
Laurel clock vine	<i>Thunbergia laurifolia</i>	0	0	0	0	0	0	0
Rosewood, tipuana tree	<i>Tipuana tipu</i>	0	0	0	0	0	0	0
Subterranean Cape sedge	<i>Trianoptiles solitaria</i>	0	0	0	0	254	8,508	8,762

*unit of measure is hectare
N/A = not available (too few data)
¹ includes *S. x chrysocoma*

Noxious Weeds Review; Phase 3a species
Goulburn Broken CMA
Regional score and rank

Scientific name	Common name	Inv. Score	Regional dist.	Impact Score	Regional score	Regional rank	Rank Relative to Phases 1&2
<i>Acacia catechu</i>	Cutch tree	0.6061	1.00	0.1080	0.4732	59	143
<i>Acacia nilotica</i>	Prickly acacia	0.5744	1.00	0.5345	0.7082	7	8
<i>Ambrosia artemisiifolia</i>	Annual ragweed	0.5760	1.00	0.2849	0.5687	38	64
<i>Ambrosia confertiflora</i>	Burr ragweed	0.5941	1.00	0.2267	0.5382	47	93
<i>Ambrosia tenuifolia</i>	Lacy ragweed	0.6041	0.85	0.1411	0.4405	65	159
<i>Annona glabra</i>	Pond apple	0.6948	1.00	0.2587	0.5682	39	66
<i>Anredera cordifolia</i>	Madeira vine	0.7660	0.71	0.3585	0.5341	48	98
<i>Asystasia gangetica</i> ssp. <i>micrantha</i>	Chinese violet	0.5931	0.85	0.2305	0.4893	58	134
<i>Barleria prionitis</i>	Barleria, porcupine flower	0.7002	1.00	0.1502	0.5081	55	118
<i>Bassia scoparia</i>	Kochia	0.6106	1.00	0.3563	0.6128	26	44
<i>Cabomba caroliniana</i>	Cabomba	0.6202	0.85	0.4813	0.6330	17	34
<i>Calluna vulgaris</i>	Heather	0.6742	0.85	0.2891	0.5318	49	100
<i>Calystegia silvatica</i>	Greater bindweed	0.3180	0.85	0.2593	0.4724	61	145
<i>Carthamus glaucus</i>	Glaucous star thistle	0.5168	1.00	0.3251	0.5841	34	58
<i>Centaurea maculosa</i>	Spotted knapweed	0.7544	0.85	0.5016	0.6604	12	22
<i>Chromolaena odorata</i>	Siam weed, chromolaena	0.7892	1.00	0.4469	0.6850	9	18
<i>Cryptostegia grandiflora</i>	Rubber vine	0.7574	1.00	0.4880	0.7042	8	9
<i>Cynoglossum creticum</i>	Blue hound's tongue	0.5987	1.00	0.2110	0.5300	50	103
<i>Cyperus teneristolon</i>	Cyperus	0.7330	0.85	0.2058	0.4922	57	130
<i>Disa bracteata</i>	African weed-orchid	0.7635	1.00	0.2567	0.5754	37	62
<i>Dittrichia viscosa</i>	False yellowhead	0.6756	1.00	0.2327	0.5514	44	84
<i>Gymnocoronis spilanthoides</i>	Senegal tea plant	0.4856	0.85	0.3575	0.5475	45	88
<i>Hedera helix</i>	English ivy	0.7455	0.42	0.3875	0.4493	64	156
<i>Hymenachne amplexicaulis</i>	Hymenachne, Olive hymenachne	0.6675	1.00	0.6456	0.7816	3	3
<i>Hypericum calycinum</i>	Large flowered St John's wort	0.5533	1.00	0.3388	0.5961	32	52
<i>Hypericum canariense</i>	Canary Island St John's wort	0.5055	0.85	0.2873	0.5106	54	115
<i>Hypericum humifusum</i>	Trailing St John's wort	0.4552	1.00	0.2088	0.5116	53	113
<i>Koeleruteria elegans</i> ssp. <i>formosana</i>	Chinese rain tree	0.5911	1.00	0.1677	0.5048	56	120
<i>Lachenalia reflexa</i>	Yellow Soldier	0.4270	1.00	0.3116	0.5657	40	67
<i>Lantana camara</i>	Lantana	0.6496	0.42	0.6372	0.5776	36	60
<i>Miconia</i> spp.	Miconia	0.8664	1.00	0.3037	0.6140	25	43
<i>Mimosa pigra</i>	Mimosa, giant sensitive plant	0.8180	1.00	0.3506	0.6345	14	30
<i>Onopordum dissectum</i>	Thistle	0.4312	1.00	0.3832	0.6063	30	49
<i>Onopordum nervosum</i>	Cotton thistle	0.5962	0.85	0.4685	0.6229	22	40
<i>Onopordum tauricum</i>	Taurian thistle	0.4682	0.85	0.3464	0.5392	46	92
<i>Opuntia aurantiaca</i>	Tiger pear	0.6516	1.00	0.6580	0.7867	2	2
<i>Parkinsonia aculeata</i>	Parkinsonia	0.6416	1.00	0.5568	0.7288	5	5
<i>Pelargonium alchemilloides</i>	Garden geranium	0.6058	1.00	0.3686	0.6191	23	41
<i>Pereskia aculeata</i>	Leaf cactus	0.7889	0.85	0.7331	0.7942	1	1
<i>Piptochaetium montevidense</i>	Uruguayan rice grass	0.7066	1.00	0.3544	0.6233	21	39
<i>Praxelis clematidea</i>	Praxelis	0.7051	1.00	0.3349	0.6121	27	45
<i>Retama raetam</i>	White weeping broom	0.6883	0.85	0.5053	0.6546	13	23
<i>Rubus alceifolius</i>	Giant bramble	0.6207	1.00	0.1977	0.5252	51	107
<i>Rubus argutus</i>	Florida blackberry	0.8084	0.85	0.4430	0.6341	15	31
<i>Rubus rugosus</i>	Keriberry	0.6752	0.85	0.4284	0.6100	28	46
<i>Sagittaria montevidensis</i>	Arrowhead	0.6835	0.85	0.4546	0.6256	18	36
<i>Sagittaria platyphylla</i>	Delta arrowhead	0.6835	0.85	0.4546	0.6256	18	36
<i>Sagittaria pygmaea</i>	Dwarf arrowhead	0.6835	1.00	0.4546	0.6766	10	19
<i>Salix alba</i>	Willows	0.5995	0.57	0.5951	0.5990	31	51
<i>Salix cinerea</i>	Willows	0.9190	0.71	0.6668	0.7251	6	6
<i>Salix fragilis</i>	Willows	0.5141	0.57	0.6283	0.6073	29	47
<i>Salix humboltiana</i>	Willows	0.5007	1.00	0.3397	0.5903	33	53
<i>Salix matsudana</i>	Willows	0.5980	0.85	0.3534	0.5586	41	75
<i>Salix nigra</i>	Willows	0.5656	0.85	0.5594	0.6701	11	21
<i>Salix purpurea</i>	Willows	0.7995	0.85	0.6302	0.7378	4	4
<i>Salix viminalis</i>	Willows	0.5605	0.85	0.4960	0.6340	16	32
<i>Salix x pendulina</i>	Willows	0.5864	0.71	0.2763	0.4665	62	150
<i>Salix x rubens</i>	Willows	0.6057	0.57	0.6283	0.6183	24	42
<i>Salix x sepulcralis</i> ¹	Willows	0.5920	0.85	0.3534	0.5579	42	76

Noxious Weeds Review; Phase 3a species
 Goulburn Broken CMA
 Regional score and rank

Scientific name	Common name	Inv. Score	Regional dist.	Impact Score	Regional score	Regional rank	Rank Relative to Phases 1&2
<i>Scolymus maculatus</i>	Spotted thistle	0.7940	1.00	0.2136	0.5549	43	80
<i>Senecio glastifolius</i>	Holly leaved senecio	0.5973	1.00	0.3018	0.5807	35	59
<i>Tamarix aphylla</i>	Athel pine, tamarisk	0.6738	0.71	0.3558	0.5215	52	108
<i>Thunbergia laurifolia</i>	Laurel clock vine	0.4405	1.00	0.4150	0.6253	20	38
<i>Tipuana tipu</i>	Rosewood, tipuana tree	0.4541	1.00	0.1403	0.4731	60	144
<i>Trianoptiles solitaria</i>	Subterranean Cape sedge	0.5107	0.85	0.1887	0.4559	63	152

* includes *S. x chrysocoma*



Noxious Weeds Review; Phase 3a species
Goulburn Broken CMA
Ranked relative to Phase 1 & 2 (highlighted in red)

Scientific name	Common name	Invasiveness Score	Regional Dist	Impact Scores	Final Score	RANK
<i>Pereskia aculeata</i>	Leaf cactus	0.788886	0.85	0.733119	0.794213	1
<i>Opuntia aurantiaca</i>	Tiger pear	0.651556	1.00	0.657976	0.786653	2
<i>Hymenachne amplexicaulis</i>	Hymenachne, Olive hymenachne	0.667534	1.00	0.645600	0.781640	3
<i>Salix purpurea</i>	Willows	0.799511	0.85	0.630180	0.737842	4
<i>Parkinsonia aculeata</i>	Parkinsonia	0.641562	1.00	0.556809	0.728801	5
<i>Salix cinerea</i>	Willows	0.919002	0.71	0.666778	0.725076	6
<i>Eichhornia crassipes</i>	Water Hyacinth	0.879335	1	0.527622	0.720989	7
<i>Acacia nilotica</i>	Prickly acacia	0.574417	1.00	0.534471	0.708234	8
<i>Cryptostegia grandiflora</i>	Rubber vine	0.757375	1.00	0.488003	0.704167	9
<i>Orobanche ramosa</i>	Branched Broomrape	0.769900	1	0.519638	0.703385	10
<i>Pennisetum macrourum</i>	African Feather Grass	0.612026	0.85	0.627185	0.696667	11
<i>Acacia erioloba</i>	Giraffe thorn	0.700000	1	0.519638	0.694997	12
<i>Hieracium</i> spp.	Hawkweeds	0.700000	1	0.519638	0.694997	12
<i>Nassella tenuissima</i>	Mexican feather grass	0.700000	1	0.519638	0.694997	12
<i>Acacia karroo</i>	Karoo thorn	0.670000	1	0.519638	0.691397	15
<i>Nassella charruana</i>	Lobed needle grass	0.650000	1	0.519638	0.688997	16
<i>Salvinia molesta</i>	Salvinia	0.587464	1	0.529090	0.686786	17
<i>Chromolaena odorata</i>	Siam weed, chromolaena	0.789234	1.00	0.446929	0.684988	18
<i>Sagittaria pygmaea</i>	Dwarf arrowhead	0.683469	1.00	0.454599	0.676592	19
<i>Fallopia japonica</i> , <i>Fallopia sachalinensis</i>	Japanese and Giant knotweed	0.506400	1	0.519638	0.671765	20
<i>Salix nigra</i>	Willows	0.565578	0.85	0.559364	0.670113	21
<i>Centaurea maculosa</i>	Spotted knapweed	0.754357	0.85	0.501646	0.660445	22
<i>Retama raetam</i>	White weeping broom	0.688328	0.85	0.505316	0.654576	23
<i>Parthenium hysterophorus</i>	Parthenium Weed	0.825166	1	0.420087	0.654269	24
<i>Nassella trichotoma</i>	Serrated Tussock	0.761536	0.57	0.675277	0.651939	25
<i>Equisetum</i> spp.	Horsetails	0.726000	0.85	0.519638	0.650117	26
<i>Alternanthera philoxeroides</i>	Alligator Weed	0.527352	0.57	0.719621	0.648670	27
<i>Prosopis</i> spp.	Mesquite	0.658431	0.85	0.521093	0.642824	28
<i>Iva axillaris</i>	Poverty Weed	0.538501	1	0.453036	0.638320	29
<i>Mimosa pigra</i>	Mimosa, giant sensitive plant	0.818008	1.00	0.350578	0.634484	30
<i>Rubus argutus</i>	Florida blackberry	0.808417	0.85	0.442982	0.634080	31
<i>Salix viminalis</i>	Willows	0.560486	0.85	0.495981	0.634008	32
<i>Rubus fruticosus</i> agg.	Blackberry	0.767146	0.42	0.726464	0.633277	33
<i>Cabomba caroliniana</i>	Cabomba	0.620155	0.85	0.481313	0.632954	34
<i>Xanthium spinosum</i>	Noogoora Burr/ Californian Burr	0.619536	0.85	0.500315	0.626521	35
<i>Sagittaria montevidensis</i>	Arrowhead	0.683469	0.85	0.454599	0.625592	36
<i>Sagittaria platyphylla</i>	Delta arrowhead	0.683469	0.85	0.454599	0.625592	36
<i>Thunbergia laurifolia</i>	Laurel clock vine	0.440524	1.00	0.415005	0.625266	38
<i>Piptochaetium montevidense</i>	Uruguayan rice grass	0.706617	1.00	0.354400	0.623258	39
<i>Onopordum nervosum</i>	Cotton thistle	0.596175	0.85	0.468505	0.622904	40
<i>Pelargonium alchemilloides</i>	Garden geranium	0.605828	1.00	0.368643	0.619139	41
<i>Salix x rubens</i>	Willows	0.605670	0.57	0.628311	0.618335	42
<i>Miconia</i> spp.	Miconia	0.866385	1.00	0.303706	0.614041	43
<i>Bassia scoparia</i>	Kochia	0.610614	1.00	0.356267	0.612783	44
<i>Praxelis clematidea</i>	Praxelis	0.705095	1.00	0.334863	0.612135	45
<i>Rubus rugosus</i>	Keriberry	0.675226	0.85	0.428443	0.609955	46
<i>Salix fragilis</i>	Willows	0.514090	0.57	0.628311	0.607345	47
<i>Convolvulus arvensis</i>	Bindweed	0.779101	0.85	0.430366	0.606497	48
<i>Onopordum dissectum</i>	Thistle	0.431190	1.00	0.383170	0.606318	49
<i>Echium vulgare</i>	Viper's Bugloss	0.655865	0.85	0.446556	0.600775	50
<i>Salix alba</i>	Willows	0.599482	0.57	0.595056	0.598969	51
<i>Hypericum calycinum</i>	Large flowered St John's wort	0.553290	1.00	0.338782	0.596113	52
<i>Salix humboldtiana</i>	Willows	0.500663	1.00	0.339666	0.590293	53
<i>Lagarosiphon major</i>	Lagarosiphon	0.649037	1	0.342517	0.589694	54
<i>Homeria flaccida</i>	Cape Tulip (two-leaf)	0.684162	0.85	0.417379	0.587832	55
<i>Centaurea solstitialis</i>	St. Barnaby's Thistle	0.655091	0.85	0.423400	0.587715	56
<i>Ulex europaeus</i>	Furze/Gorse	0.828248	0.57	0.545087	0.587038	57
<i>Carthamus glaucus</i>	Glaucous star thistle	0.516750	1.00	0.325102	0.584067	58
<i>Senecio glastifolius</i>	Holly leaved senecio	0.597307	1.00	0.301771	0.580669	59
<i>Lantana camara</i>	Lantana	0.649647	0.42	0.637247	0.577616	60
<i>Acroptilon repens</i>	Hardheads/Russian Knapweed	0.514006	0.85	0.434553	0.577030	61
<i>Disa bracteata</i>	African weed-orchid	0.763497	1.00	0.256714	0.575379	62
<i>Nassella neesiana</i>	Chilean needle grass	0.686622	0.57	0.543816	0.569332	63
<i>Ambrosia artemisiifolia</i>	Annual ragweed	0.575985	1.00	0.284903	0.568664	64
<i>Cirsium arvense</i>	Californian/Perennial Thistle	0.702729	0.71	0.458673	0.568385	65
<i>Annona glabra</i>	Pond apple	0.694802	1.00	0.258663	0.568228	66
<i>Lachenalia reflexa</i>	Yellow Soldier	0.426976	1.00	0.311622	0.565746	67
<i>Homeria miniata</i>	Cape Tulip (one-leaf)	0.747658	0.71	0.440860	0.563800	68

Noxious Weeds Review; Phase 3a species
Goulburn Broken CMA
Ranked relative to Phase 1 & 2 (highlighted in red)

Scientific name	Common name	Invasiveness Score	Regional Dist	Impact Scores	Final Score	RANK
Rosa rubiginosa	Sweet Briar	0.793721	0.57	0.508953	0.562660	69
Cytisus scoparius	English Broom	0.734874	0.57	0.520938	0.562310	70
Onopordum illyricum	Illyrian Thistle	0.533147	0.85	0.401999	0.561097	71
Datura ferox	Thorn Apple (common)	0.703633	0.71	0.444751	0.560697	72
Datura stramonium	Thorn Apple (longspine)	0.703600	0.71	0.444751	0.560693	73
Datura innoxia	Thorn Apple (recurved)	0.703600	0.71	0.444751	0.560693	73
Salix matsudana	Willows	0.598025	0.85	0.353359	0.558644	75
Salix x sepulcralis'	Willows	0.592031	0.85	0.353359	0.557925	76
Alhagi maurorum	Camelthorn	0.569959	0.85	0.386286	0.556715	77
Cuscuta spp.	Dodder	0.734033	0.71	0.429397	0.555746	78
Hypericum triquetrfolium	Tangled Hypericum	0.602251	0.85	0.377231	0.555520	79
Scolymus maculatus	Spotted thistle	0.794014	1.00	0.213592	0.554893	80
Cannabis sativa	Marijuana	0.565385	1	0.297461	0.554424	81
Onopordum acanthium	Scotch/Heraldic Thistle	0.571238	0.85	0.381627	0.554260	82
Allium triquetrum	Angled Onion	0.614461	0.71	0.448094	0.551868	83
Dittrichia viscosa	False yellowhead	0.675616	1.00	0.232653	0.551360	84
Tribulus terrestris	Caltrop	0.606654	0.85	0.368584	0.551205	85
Festuca gautieri	bearskin fescue	0.491440	0.85	0.387816	0.548150	86
Amsinckia spp.	Amsinckia	0.745464	0.85	0.333240	0.548070	87
Gymnocoronis spilanthoides	Senegal tea plant	0.485586	0.85	0.357542	0.547494	88
Salpichroa origanifolia	Pampas Lily-of-the-Valley	0.762638	0.85	0.320066	0.542753	89
Opuntia robusta	Wheel Cactus	0.645158	0.85	0.345016	0.542628	90
Senecio pterophorus	African Daisy	0.676556	0.85	0.337358	0.542107	91
Onopordum tauricum	Taurian thistle	0.468246	0.85	0.346370	0.539157	92
Ambrosia confertiflora	Burr ragweed	0.594088	1.00	0.226697	0.538241	93
Chondrilla juncea	Skeleton Weed	0.742382	0.85	0.315662	0.537856	94
Ailanthus altissima	Tree of Heaven	0.895314	0.57	0.441183	0.536900	95
Cardaria draba	Hoary Cress	0.563497	0.71	0.429138	0.535137	96
Ambrosia psilostachya	Perennial Ragweed	0.489293	0.85	0.364356	0.534755	97
Anredera cordifolia	Madeira vine	0.766046	0.71	0.358456	0.534061	98
Eragrostis curvula	African Lovegrass	0.715330	0.85	0.314456	0.533935	99
Calluna vulgaris	Heather	0.674172	0.85	0.289081	0.531786	100
Opuntia stricta	Prickly Pear (drooping)	0.552003	0.85	0.345016	0.531449	101
Lavandula stoechas	Topped Lavender	0.682210	0.85	0.316423	0.531062	102
Cynoglossum creticum	Blue hound's tongue	0.598661	1.00	0.210974	0.529985	103
Marrubium vulgare	Horehound	0.771737	0.57	0.451853	0.528046	104
Lycium ferocissimum	Boxthorn	0.674957	0.57	0.470710	0.526993	105
Centaurea nigra	Black Knapweed	0.641607	0.85	0.317275	0.526667	106
Rubus alceifolius	Giant bramble	0.620743	1.00	0.197677	0.525188	107
Tamarix aphylla	Athel pine, tamarisk	0.673811	0.71	0.355786	0.521497	108
Alternanthera pungens	Khaki Weed	0.653479	0.85	0.303604	0.520436	109
Cytisus multiflorus	white Spanish broom	0.517034	0.85	0.330775	0.519278	110
Cestrum parqui	Chilean Cestrum	0.727801	0.71	0.358471	0.515280	111
Conium maculatum	Hemlock	0.665290	0.57	0.446703	0.512388	112
Hypericum humifusum	Trailing St John's wort	0.455230	1.00	0.208817	0.511565	113
Opuntia vulgaris	Prickly Pear (erect)	0.759228	0.71	0.345016	0.511516	114
Hypericum canariense	Canary Island St John's wort	0.505525	0.85	0.287333	0.510570	115
Sagittaria graminea	Arrowhead	0.586551	0.85	0.298489	0.509540	116
Sida leprosa	Ivy-leaved Sida	0.485639	1	0.234041	0.509339	117
Barleria prionitis	Barleria, porcupine flower	0.700199	1.00	0.150169	0.508118	118
Solanum elaeagnifolium	Silverleaf Nightshade	0.667968	0.71	0.357925	0.507794	119
Koelreuteria elegans ssp.formosa	Chinese rain tree	0.591073	1.00	0.167702	0.504842	120
Calicotome spinosa	Spiny Broom	0.447135	0.85	0.317558	0.503489	121
Crataegus monogyna	Hawthorn	0.704590	0.42	0.506902	0.502816	122
Spartium junceum	Spanish broom	0.341815	0.85	0.33587	0.501105	123
Scolymus hispanicus	Golden Thistle	0.497723	0.71	0.377717	0.498448	124
Hypericum tetrapterum	St. Peter's Wort	0.552896	0.85	0.284303	0.497557	125
Cenchrus longispinus	Spiny Burr Grass/ Gentle Annie	0.402417	0.85	0.313125	0.495640	126
Onopordum acaulon	Stemless Thistle	0.528267	0.85	0.285015	0.495001	127
Cynara cardunculus	Artichoke Thistle	0.662745	0.57	0.413264	0.493358	128
Echium plantagineum	Paterson's Curse	0.665066	0.57	0.412722	0.493332	129
Cyperus teneristolon	Cyperus	0.732975	0.85	0.205759	0.492182	130
Silybum marianum	Variegated Thistle	0.765111	0.57	0.387726	0.491340	131
Centaurea calcitrapa	Star Thistle	0.408196	0.85	0.303943	0.491192	132
Juncus acutus	Spiny Rush	0.516930	0.57	0.438554	0.490022	133
Asystasia gangetica ssp. micrantha	Chinese violet	0.593129	0.85	0.230522	0.489268	134
Carduus nutans	Nodding Thistle	0.390918	0.85	0.302426	0.488269	135
Physalis viscosa	Prairie Ground Cherry	0.727781	0.71	0.309365	0.487778	136

Noxious Weeds Review; Phase 3a species
Goulburn Broken CMA
Ranked relative to Phase 1 & 2 (highlighted in red)

Scientific name	Common name	Invasiveness Score	Regional Dist	Impact Scores	Final Score	RANK
Genista linifolia	Flax Leaved Broom	0.703726	0.57	0.392163	0.486458	137
Nassella hyalina	cane needle grass	0.503576	0.85	0.267807	0.482401	138
Ibicella lutea	Devil's Claw (yellowflower)	0.616016	0.85	0.241384	0.481097	139
Asparagus asparagoides	bridal creeper	0.782848	0.57	0.361907	0.479010	140
Emex australis	Spiny Emex	0.535113	0.85	0.247396	0.474755	141
Cirsium acarna	Soldier Thistle	0.523968	0.85	0.249563	0.474632	142
Acacia catechu	Cutch tree	0.606058	1.00	0.107969	0.473190	143
Tipuana tipu	Rosewood, tipuana tree	0.454073	1.00	0.140342	0.473080	144
Calystegia silvatica	Greater bindweed	0.317991	0.85	0.259324	0.472380	145
Proboscidea louisianica	Devil's Claw (purpleflower)	0.542172	0.85	0.241384	0.472236	146
Hypericum androsaemum	Tutsan	0.746650	0.71	0.276452	0.471611	147
Solanum rostratum	Buffalo Burr	0.468698	0.85	0.254399	0.470707	148
Carthamus lanatus	Saffron Thistle	0.499430	0.57	0.405518	0.469422	149
Salix x pendulina	Willows	0.586438	0.71	0.276310	0.466506	150
Carduus tenuiflorus / C. pycnocephalus	Slender/Shore Thistle	0.608219	0.57	0.359060	0.456460	151
Trianoptiles solitaria	Subterranean Cape sedge	0.510665	0.85	0.188664	0.455932	152
Pittosporum undulatum	sweet pittosporum	0.793704	0.57	0.315117	0.454110	153
Genista monspessulana	Cape Broom /Montpellier Broom	0.698418	0.42	0.419839	0.453320	154
Xanthium strumarium	Bathurst Burr	0.585163	0.57	0.356250	0.452120	155
Hedera helix	English ivy	0.745474	0.42	0.387495	0.449254	156
Hypericum perforatum	St. John's Wort	0.660601	0.57	0.334271	0.448864	157
Leucanthemum vulgare	Ox-eye Daisy	0.610238	0.57	0.333108	0.442169	158
Ambrosia tenuifolia	Lacy ragweed	0.604084	0.85	0.141134	0.440525	159
Chrysanthemoides monilifera	Boneseed/Bitou Bush	0.799614	0.42	0.375091	0.440405	160
Nassella leucotricha	Texas needle grass	0.627929	0.57	0.326146	0.440393	161
Dittrichia graveolens	Stinkwort	0.607585	0.57	0.319717	0.434352	162
Senecio jacobaea	Ragwort	0.776347	0.42	0.363784	0.431281	163
Vinca major	blue periwinkle	0.703021	0.57	0.289181	0.428704	164
Dipsacus fullonum	Wild Teasel	0.551563	0.57	0.309552	0.421937	165
Allium vineale	Wild Garlic	0.658241	0.57	0.285822	0.421449	166
Melianthus comosus	Tufted Honeyflower	0.492463	0.42	0.394016	0.414144	167
Solanum linnaeanum	Apple of Sodom	0.356227	0.57	0.325025	0.407161	168
Verbascum thapsus	Great Mullein	0.474171	0.57	0.296038	0.405082	169
Watsonia meriana 'Bulbillifera'	Wild Watsonia	0.402004	0.57	0.307647	0.402923	170
Foeniculum vulgare	Fennel	0.574220	0.42	0.326980	0.386415	171
Oxalis pes-caprae	Soursob	0.743995	0.28	0.365451	0.383532	172
Asphodelus fistulosus	Onion Weed	0.539790	0.42	0.328848	0.383330	173
Diplotaxis tenuifolia	Sand Rocket/Sand Mustard	0.565974	0.42	0.317803	0.380286	174
Cirsium vulgare	Spear Thistle	0.693549	0.28	0.353660	0.370875	175
Reseda luteola	Wild Mignonette	0.537021	0.57	0.167145	0.340444	176

* includes S. x chrysocoma



Noxious Weeds Review; Phase 3a species

Goulburn Broken CMA

Present distribution and calculation of potential distribution score

Common name	Scientific name	IPMS	area of infestation (ha)	FIS	Regional Estimate		Weight	Estimate based on: regional description, present potential ratio or gut feeling
		# infestations		# infestations	# infestations	area of infestation		
Cutch tree	<i>Acacia catechu</i>	0	0	0		0.100	1.00	PIRVic estimate
Prickly acacia	<i>Acacia nilotica</i>	0	0	0		0.100	1.00	PIRVic estimate
Ragweeds annual	<i>Ambrosia artemisiifolia</i>	0	0	0		1.000	1.00	PIRVic estimate
Burr ragweed	<i>Ambrosia confertiflora</i>	0	0	0		1.000	1.00	PIRVic estimate
Lacy ragweed	<i>Ambrosia tenuifolia</i>	0	0	0		1.000	0.85	PIRVic estimate
Pond apple	<i>Annona glabra</i>	0	0	0		0.100	1.00	PIRVic estimate
Madeira vine	<i>Anredera cordifolia</i>	0	0	0	5	0.500	0.71	Gut feel. I would expect it is along some waterways in the GB.
Chinese violet	<i>Asystasia gangetica ssp. Micrantha</i>	0	0	0		1.000	0.85	PIRVic estimate
Barleria, porcupine flower	<i>Barleria prionitis</i>	0	0	0		0.100	1.00	PIRVic estimate
Kochia	<i>Bassia scoparia</i>	0	0	0		1.000	1.00	PIRVic estimate
Cabomba	<i>Cabomba caroliniana</i>	0	0	6		0.100	0.85	PIRVic estimate
Heather	<i>Calluna vulgaris</i>	0	0	0		1.000	0.85	PIRVic estimate
Greater bindweed	<i>Calystegia silvatica</i>	0	0	0		1.000	0.85	PIRVic estimate
Glaucous star thistle	<i>Carthamus glaucus</i>	0	0	0		1.000	1.00	PIRVic estimate
Spotted knapweed	<i>Centaurea maculosa</i>	0	0	0		1.000	0.85	PIRVic estimate
Siam weed, chromolaena	<i>Chromolaena odorata</i>	0	0	0		0.100	1.00	PIRVic estimate
Rubber vine	<i>Cryptostegia grandiflora</i>	0	0	0		0.100	1.00	PIRVic estimate
Blue hound's tongue	<i>Cynoglossum creticum</i>	0	0	0		1.000	1.00	PIRVic estimate
Cyperus	<i>Cyperus teneristolon</i>	0	0	0		1.000	0.85	PIRVic estimate
African weed-orchid	<i>Disa bracteata</i>	0	0	0		1.000	1.00	PIRVic estimate
False yellowhead	<i>Dittrichia viscosa</i>	0	0	0		1.000	1.00	PIRVic estimate
Senegal tea plant	<i>Gymnocoronis spilanthoides</i>	0	0	2		1.000	0.85	PIRVic estimate
English ivy	<i>Hedera helix</i>	9	9	19	6	5.000	0.42	Known infestations in the Seymour area. Wide spread in gardens. Escapee along waterways
Hymenachne, Olive hymenachne	<i>Hymenachne amplexicaulis</i>	0	0	0		0.100	1.00	PIRVic estimate
Large flowered St John's wort	<i>Hypericum calycinum</i>	0	0	0		1.000	1.00	PIRVic estimate
Canary Island St John's wort	<i>Hypericum canariense</i>	0	0	0		1.000	0.85	PIRVic estimate
Trailing St John's wort	<i>Hypericum humifusum</i>	0	0	0		1.000	1.00	PIRVic estimate
Chinese rain tree	<i>Koeleruteria elegans ssp. formosana</i>	0	0	0		0.100	1.00	PIRVic estimate
Yellow Soldier	<i>Lachenalia reflexa</i>	0	0	0		0.100	1.00	PIRVic estimate
Lantana	<i>Lantana camara</i>	0	0	0		10.000	0.42	Widespread throughout gardens. No known escapees into the natural landscape.
Miconia	<i>Miconia spp.</i>	0	0	0		1.000	1.00	PIRVic estimate
Mimosa, giant sensitive plant	<i>Mimosa pigra</i>	0	0	0		0.100	1.00	PIRVic estimate
Thistle	<i>Onopordum dissectum</i>	0	0	0		0.000	1.00	PIRVic estimate
Cotton thistle	<i>Onopordum nervosum</i>	0	0	0		1.000	0.85	PIRVic estimate
Taurian thistle	<i>Onopordum tauricum</i>	2	2	3		1.000	0.85	PIRVic estimate
Tiger pear	<i>Opuntia aurantiaca</i>	0	0	3	6	0.500	1.00	PIRVic estimate
Parkinsonia	<i>Parkinsonia aculeata</i>	0	0	0		0.100	1.00	PIRVic estimate
Garden geranium	<i>Pelargonium alchemilloides</i>	0	0	0		1.000	1.00	PIRVic estimate
Leaf cactus	<i>Pereskia aculeata</i>	0	0	0		1.000	0.85	PIRVic estimate
Uruguayan rice grass	<i>Piptochaetium montevidense</i>	0	0	0		1.000	1.00	PIRVic estimate
Praxelis	<i>Praxelis clematidea</i>	0	0	0		0.100	1.00	PIRVic estimate
White weeping broom	<i>Retama raetam</i>	0	0	0		1.000	0.85	PIRVic estimate
Giant bramble	<i>Rubus alceifolius</i>	0	0	0		1.000	1.00	PIRVic estimate
Florida blackberry	<i>Rubus argutus</i>	0	0	0		1.000	0.85	PIRVic estimate
Keriberry	<i>Rubus rugosus</i>	0	0	0		1.000	0.85	PIRVic estimate
Arrowhead	<i>Sagittaria montevidensis</i>	0	0	0		1.000	0.85	PIRVic estimate
Delta arrowhead	<i>Sagittaria platyphylla</i>	0	0	16		1.000	0.85	PIRVic estimate
Dwarf arrowhead	<i>Sagittaria pygmaea</i>	0	0	0		1.000	1.00	PIRVic estimate
Willows	<i>Salix alba</i>	0	0	9		9.000	0.57	PIRVic estimate (FIS)
Willows	<i>Salix cinerea</i>	0	0	9		9.000	0.71	PIRVic estimate (FIS)
Willows	<i>Salix fragilis</i>	0	0	31		31.000	0.57	PIRVic estimate (FIS)
Willows	<i>Salix humboldtiana</i>	0	0	0		0.100	1.00	PIRVic estimate (FIS)
Willows	<i>Salix matsudana</i>	0	0	0		0.100	0.85	PIRVic estimate (FIS)
Willows	<i>Salix nigra</i>	0	0	0		0.100	0.85	PIRVic estimate (FIS)
Willows	<i>Salix purpurea</i>	0	0	0		0.100	0.85	PIRVic estimate (FIS)
Willows	<i>Salix viminalis</i>	0	0	0		0.100	0.85	PIRVic estimate (FIS)
Willows	<i>Salix x pendulina</i>	0	0	0		0.100	0.71	PIRVic estimate (FIS)
Willows	<i>Salix x rubens</i>	3	5	7		12.000	0.57	PIRVic estimate (FIS/IPMS)
Willows	<i>Salix x sepulcralis</i> ¹	0	0	0		0.100	0.85	PIRVic estimate (FIS)
Spotted thistle	<i>Scolymus maculatus</i>	0	0	0		1.000	1.00	PIRVic estimate
Holly leaved senecio	<i>Senecio glastifolius</i>	0	0	0		0.100	1.00	PIRVic estimate
Athel pine, tamarisk	<i>Tamarix aphylla</i>	0	0	0	30	2.000	0.71	
Laurel clock vine	<i>Thunbergia laurifolia</i>	0	0	0		0.100	1.00	PIRVic estimate
Rosewood, tipuana tree	<i>Tipuana tipu</i>	0	0	0		0.100	1.00	PIRVic estimate
Subterranean Cape sedge	<i>Trianoptiles solitaria</i>	0	0	0		1.000	0.85	PIRVic estimate

¹ includes *S. x chrysocoma*



Noxious Weeds Review; Phase 3a species
Goulburn Broken CMA
Potential distribution by landuse and public land

Common name	Scientific name	Potential area* infested by landuse type						Potential total area
		Horticulture	Broadacre cropping	Forestry	Pasture dryland	Pasture irrigated	Public land	
Cutch tree	<i>Acacia catechu</i>	0	0	0	0	0	0	0
Prickly acacia	<i>Acacia nilotica</i>	0	0	0	668,400	224,467	371,200	1,264,067
Annual ragweed	<i>Ambrosia artemisiifolia</i>	39,215	668,747	0	723,883	224,467	5,160	1,661,472
Burr ragweed	<i>Ambrosia confertiflora</i>	0	668,747	0	682,947	224,467	7,890	1,584,051
Lacy ragweed	<i>Ambrosia tenuifolia</i>	0	0	0	723,883	0	5,160	729,043
Pond apple	<i>Annona glabra</i>	0	0	0	0	0	0	0
Madeira vine	<i>Anredera cordifolia</i>	0	0	28,400	0	0	695,200	723,600
Chinese violet	<i>Asystasia gangetica ssp. micrantha</i>	32,600	45,800	28,400	0	0	0	106,800
Barleria, porcupine flower	<i>Barleria prionitis</i>	0	0	0	0	0	0	0
Kochia	<i>Bassia scoparia</i>	0	668,800	0	722,400	0	5,200	1,396,400
Cabomba	<i>Cabomba caroliniana</i>	0	0	0	0	0	97,200	97,200
Heather	<i>Calluna vulgaris</i>	0	0	28,400	716,000	0	18,100	762,500
Greater bindweed	<i>Calystegia silvatica</i>	39,215	0	0	723,883	0	0	763,098
Glaucous star thistle	<i>Carthamus glaucus</i>	0	666,193	0	451,408	0	0	1,117,601
Spotted knapweed	<i>Centaurea maculosa</i>	0	0	0	682,900	224,467	56,600	963,967
Siam weed, chromolaena	<i>Chromolaena odorata</i>	0	0	0	0	0	0	0
Rubber vine	<i>Cryptostegia grandiflora</i>	0	0	0	0	0	0	0
Blue hound's tongue	<i>Cynoglossum creticum</i>	35,800	0	0	682,900	0	340,800	1,059,500
Cyperus	<i>Cyperus teneristolon</i>	34,978	587,429	0	0	224,467	4,733	816,629
African weed-orchid	<i>Disa bracteata</i>	0	0	0	685,338	224,467	482,457	1,392,262
False yellowhead	<i>Dittrichia viscosa</i>	0	0	0	723,883	224,467	56,612	1,004,962
Senegal tea plant	<i>Gymnocoronis spilanthoides</i>	0	0	0	0	224,467	150,400	374,867
English ivy	<i>Hedera helix</i>	0	0	28,413	0	0	627,791	656,204
Hymenachne, Olive hymenachne	<i>Hymenachne amplexicaulis</i>	0	0	0	0	0	0	0
Large flowered St John's wort	<i>Hypericum calycinum</i>	0	0	0	723,883	224,467	65,813	1,014,163
Canary Island St John's wort	<i>Hypericum canariense</i>	0	0	0	682,947	224,467	5,160	912,574
Trailing St John's wort	<i>Hypericum humifusum</i>	0	563,585	0	717,146	182,557	9,422	1,472,710
Chinese rain tree	<i>Koelreuteria elegans ssp. formosana</i>	0	0	0	0	0	0	0
Yellow Soldier	<i>Lachenalia reflexa</i>	0	0	0	0	0	0	0
Lantana	<i>Lantana camara</i>	0	0	28,400	723,900	224,467	273,700	1,250,467
Miconia	<i>Miconia spp.</i>	0	0	0	0	0	0	0
Mimosa, giant sensitive plant	<i>Mimosa pigra</i>	0	0	0	0	0	0	0
Thistle	<i>Onopordum dissectum</i>							N/A
Cotton thistle	<i>Onopordum nervosum</i>	35,839	0	0	682,947	0	11,852	730,638
Taurian thistle	<i>Onopordum tauricum</i>	0	0	0	682,947	224,467	63,083	970,497
Tiger pear	<i>Opuntia aurantiaca</i>	0	0	0	723,883	0	65,813	789,696
Parkinsonia	<i>Parkinsonia aculeata</i>	0	0	0	666,900	0	316,300	983,200
Garden geranium	<i>Pelargonium alchemilloides</i>	0	0	0	721,492	224,467	279,975	1,225,934
Leaf cactus	<i>Pereskia aculeata</i>	0	0	9,000	0	0	118,400	127,400
Uruguayan rice grass	<i>Piptochaetium montevidense</i>	0	668,800	0	682,900	0	56,600	1,408,300
Praxelis	<i>Praxelis clematidea</i>	0	0	0	0	0	0	0
White weeping broom	<i>Retama raetam</i>	0	0	0	684,430	0	72,018	756,448
Giant bramble	<i>Rubus alceifolius</i>	0	0	0	0	0	0	0
Florida blackberry	<i>Rubus argutus</i>	0	0	26,400	0	0	328,500	354,900
Keriberry	<i>Rubus rugosus</i>	0	0	0	0	0	119,074	119,074
Arrowhead	<i>Sagittaria montevidensis</i>	0	0	0	0	224,467	148,500	372,967
Delta arrowhead	<i>Sagittaria platyphylla</i>	0	0	0	0	224,467	148,500	372,967
Dwarf arrowhead	<i>Sagittaria pygmaea</i>	0	0	0	0	0	0	0
Willows	<i>Salix alba</i>	0	0	0	0	0	54,224	54,224
Willows	<i>Salix cinerea</i>	0	0	0	0	0	143,342	143,342
Willows	<i>Salix fragilis</i>	0	0	0	0	0	54,224	54,224
Willows	<i>Salix humboltiana</i>	0	0	0	0	0	0	0
Willows	<i>Salix matsudana</i>	0	0	0	0	0	54,224	54,224
Willows	<i>Salix nigra</i>	0	0	0	0	0	53,956	53,956
Willows	<i>Salix purpurea</i>	0	0	0	0	0	54,224	54,224
Willows	<i>Salix viminalis</i>	0	0	0	0	0	54,224	54,224
Willows	<i>Salix x pendulina</i>	0	0	0	0	0	6,538	6,538
Willows	<i>Salix x rubens</i>	0	0	0	0	0	54,224	54,224
Willows	<i>Salix x sepulcralis</i> ¹	0	0	0	0	0	54,224	54,224
Spotted thistle	<i>Scolymus maculatus</i>	0	666,149	0	339,799	224,467	63,117	1,293,532
Holly leaved senecio	<i>Senecio glastifolius</i>	0	0	0	722,797	93,857	4,631	821,285
Athel pine, tamarisk	<i>Tamarix aphylla</i>	0	0	0	0	0	53,430	53,430
Laurel clock vine	<i>Thunbergia laurifolia</i>	0	0	0	0	0	0	0
Rosewood, tipuana tree	<i>Tipuana tipu</i>	0	0	0	0	0	0	0
Subterranean Cape sedge	<i>Trianoptiles solitaria</i>	0	0	0	0	224,467	101,424	325,891

*unit of measure is hectare
N/A = not available (too few data)
¹ includes *S. x chrysocoma*

Noxious Weeds Review; Phase 3a species
Mallee CMA
Regional score and rank

Scientific name	Common name	Inv. Score	Regional dist.	Impact Score	Regional score	Regional rank	Rank Relative to Phases 1&2
<i>Acacia catechu</i>	Cutch tree	0.6061	1.00	0.1080	0.4732	61	145
<i>Acacia nilotica</i>	Prickly acacia	0.5744	1.00	0.5345	0.7082	8	9
<i>Ambrosia artemisiifolia</i>	Annual ragweed	0.5760	1.00	0.2849	0.5687	42	68
<i>Ambrosia confertiflora</i>	Burr ragweed	0.5941	1.00	0.2267	0.5382	50	96
<i>Ambrosia tenuifolia</i>	Lacy ragweed	0.6041	1.00	0.1411	0.4915	60	133
<i>Annona glabra</i>	Pond apple	0.6948	1.00	0.2587	0.5682	43	70
<i>Anredera cordifolia</i>	Madeira vine	0.7660	0.85	0.3585	0.5817	37	61
<i>Asystasia gangetica</i> ssp. <i>micrantha</i>	Chinese violet	0.5931	1.00	0.2305	0.5403	49	95
<i>Barleria prionitis</i>	Barleria, porcupine flower	0.7002	1.00	0.1502	0.5081	54	117
<i>Bassia scoparia</i>	Kochia	0.6106	1.00	0.3563	0.6128	29	47
<i>Cabomba caroliniana</i>	Cabomba	0.6202	1.00	0.4813	0.6840	15	24
<i>Calluna vulgaris</i>	Heather	0.6742	1.00	0.2891	0.5828	36	60
<i>Calystegia silvatica</i>	Greater bindweed	0.3180	0.57	0.2593	0.3772	65	174
<i>Carthamus glaucus</i>	Glaucous star thistle	0.5168	1.00	0.3251	0.5841	35	59
<i>Centaurea maculosa</i>	Spotted knapweed	0.7544	0.85	0.5016	0.6604	20	30
<i>Chromolaena odorata</i>	Siam weed, chromolaena	0.7892	1.00	0.4469	0.6850	14	23
<i>Cryptostegia grandiflora</i>	Rubber vine	0.7574	1.00	0.4880	0.7042	10	11
<i>Cynoglossum creticum</i>	Blue hound's tongue	0.5987	1.00	0.2110	0.5300	51	104
<i>Cyperus teneristolon</i>	Cyperus	0.7330	1.00	0.2058	0.5432	48	91
<i>Disa bracteata</i>	African weed-orchid	0.7635	1.00	0.2567	0.5754	40	65
<i>Dittrichia viscosa</i>	False yellowhead	0.6756	0.85	0.2327	0.5004	57	124
<i>Gymnocoronis spilanthoides</i>	Senegal tea plant	0.4856	1.00	0.3575	0.5985	33	53
<i>Hedera helix</i>	English ivy	0.7455	0.42	0.3875	0.4493	64	156
<i>Hymenachne amplexicaulis</i>	Hymenachne, Olive hymenachne	0.6675	1.00	0.6456	0.7816	4	4
<i>Hypericum calycinum</i>	Large flowered St John's wort	0.5533	0.71	0.3388	0.4975	58	127
<i>Hypericum canariense</i>	Canary Island St John's wort	0.5055	1.00	0.2873	0.5616	45	75
<i>Hypericum humifusum</i>	Trailing St John's wort	0.4552	1.00	0.2088	0.5116	53	113
<i>Koeleruteria elegans</i> ssp. <i>formosana</i>	Chinese rain tree	0.5911	1.00	0.1677	0.5048	56	120
<i>Lachenalia reflexa</i>	Yellow Soldier	0.4270	0.71	0.3116	0.4671	63	151
<i>Lantana camara</i>	Lantana	0.6496	0.42	0.6372	0.5776	39	63
<i>Miconia</i> spp.	Miconia	0.8664	1.00	0.3037	0.6140	28	46
<i>Mimosa pigra</i>	Mimosa, giant sensitive plant	0.8180	1.00	0.3506	0.6345	21	37
<i>Onopordum dissectum</i>	Thistle	0.4312	1.00	0.3832	0.6063	32	51
<i>Onopordum nervosum</i>	Cotton thistle	0.5962	1.00	0.4685	0.6739	17	26
<i>Onopordum tauricum</i>	Taurian thistle	0.4682	0.71	0.3464	0.4916	59	132
<i>Opuntia aurantiaca</i>	Tiger pear	0.6516	1.00	0.6580	0.7867	3	3
<i>Parkinsonia aculeata</i>	Parkinsonia	0.6416	1.00	0.5568	0.7288	6	6
<i>Pelargonium alchemilloides</i>	Garden geranium	0.6058	1.00	0.3686	0.6191	27	45
<i>Pereskia aculeata</i>	Leaf cactus	0.7889	1.00	0.7331	0.8452	1	1
<i>Piptochaetium montevidense</i>	Uruguayan rice grass	0.7066	1.00	0.3544	0.6233	26	44
<i>Praxelis clematidea</i>	Praxelis	0.7051	1.00	0.3349	0.6121	30	48
<i>Retama raetam</i>	White weeping broom	0.6883	1.00	0.5053	0.7056	9	10
<i>Rubus alceifolius</i>	Giant bramble	0.6207	1.00	0.1977	0.5252	52	108
<i>Rubus argutus</i>	Florida blackberry	0.8084	1.00	0.4430	0.6851	13	22
<i>Rubus rugosus</i>	Keriberry	0.6752	1.00	0.4284	0.6610	19	29
<i>Sagittaria montevidensis</i>	Arrowhead	0.6835	0.85	0.4546	0.6256	23	41
<i>Sagittaria platyphylla</i>	Delta arrowhead	0.6835	0.85	0.4546	0.6256	23	41
<i>Sagittaria pygmaea</i>	Dwarf arrowhead	0.6835	1.00	0.4546	0.6766	16	25
<i>Salix alba</i>	Willows	0.5995	0.85	0.5951	0.6942	12	18
<i>Salix cinerea</i>	Willows	0.9190	1.00	0.6668	0.8237	2	2
<i>Salix fragilis</i>	Willows	0.5141	0.85	0.6283	0.7025	11	13
<i>Salix humboltiana</i>	Willows	0.5007	1.00	0.3397	0.5903	34	54
<i>Salix matsudana</i>	Willows	0.5980	0.85	0.3534	0.5586	46	80
<i>Salix nigra</i>	Willows	0.5656	0.85	0.5594	0.6701	18	28
<i>Salix purpurea</i>	Willows	0.7995	0.85	0.6302	0.7378	5	5
<i>Salix viminalis</i>	Willows	0.5605	0.85	0.4960	0.6340	22	38
<i>Salix x pendulina</i>	Willows	0.5864	1.00	0.2763	0.5651	44	71
<i>Salix x rubens</i>	Willows	0.6057	0.85	0.6283	0.7135	7	8
<i>Salix x sepulcralis</i> ¹	Willows	0.5920	1.00	0.3534	0.6089	31	49

Noxious Weeds Review; Phase 3a species
Mallee CMA
Regional score and rank

Scientific name	Common name	Inv. Score	Regional dist.	Impact Score	Regional score	Regional rank	Rank Relative to Phases 1&2
<i>Scolymus maculatus</i>	Spotted thistle	0.7940	1.00	0.2136	0.5549	47	84
<i>Senecio glastifolius</i>	Holly leaved senecio	0.5973	1.00	0.3018	0.5807	38	62
<i>Tamarix aphylla</i>	Athel pine, tamarisk	0.6738	0.85	0.3558	0.5691	41	67
<i>Thunbergia laurifolia</i>	Laurel clock vine	0.4405	1.00	0.4150	0.6253	25	43
<i>Tipuana tipu</i>	Rosewood, tipuana tree	0.4541	1.00	0.1403	0.4731	62	146
<i>Trianoptiles solitaria</i>	Subterranean Cape sedge	0.5107	1.00	0.1887	0.5069	55	119

* includes *S. x chrysocoma*



Noxious Weeds Review; Phase 3a species
Mallee CMA
Ranked relative to Phase 1 & 2 (highlighted in red)

Scientific name	Common name	Invasiveness Score	Regional Dist	Impact Scores	Final Score	RANK
<i>Pereskia aculeata</i>	Leaf cactus	0.788886	1.00	0.733119	0.845213	1
<i>Salix cinerea</i>	Willows	0.919002	1.00	0.666778	0.823676	2
<i>Opuntia aurantiaca</i>	Tiger pear	0.651556	1.00	0.657976	0.786653	3
<i>Hymenachne amplexicaulis</i>	Hymenachne, Olive hymenachne	0.667534	1.00	0.645600	0.781640	4
<i>Salix purpurea</i>	Willows	0.799511	0.85	0.630180	0.737842	5
<i>Parkinsonia aculeata</i>	Parkinsonia	0.641562	1.00	0.556809	0.728801	6
<i>Eichhornia crassipes</i>	Water Hyacinth	0.879335	1	0.527622	0.720989	7
<i>Salix x rubens</i>	Willows	0.605670	0.85	0.628311	0.713535	8
<i>Acacia nilotica</i>	Prickly acacia	0.574417	1.00	0.534471	0.708234	9
<i>Retama raetam</i>	White weeping broom	0.688328	1.00	0.505316	0.705576	10
<i>Cryptostegia grandiflora</i>	Rubber vine	0.757375	1.00	0.488003	0.704167	11
<i>Orobanche ramosa</i>	Branched Broomrape	0.769900	1	0.519638	0.703385	12
<i>Salix fragilis</i>	Willows	0.514090	0.85	0.628311	0.702545	13
<i>Pennisetum macrourum</i>	African Feather Grass	0.612026	0.85	0.627185	0.696667	14
<i>Acacia erioloba</i>	Giraffe thorn	0.700000	1	0.519638	0.694997	15
<i>Hieracium</i> spp.	Hawkweeds	0.700000	1	0.519638	0.694997	15
<i>Nassella tenuissima</i>	Mexican feather grass	0.700000	1	0.519638	0.694997	15
<i>Salix alba</i>	Willows	0.599482	0.85	0.595056	0.694169	18
<i>Acacia karroo</i>	Karoo thorn	0.670000	1	0.519638	0.691397	19
<i>Nassella charruana</i>	Lobed needle grass	0.650000	1	0.519638	0.688997	20
<i>Salvinia molesta</i>	Salvinia	0.587464	1	0.529090	0.686786	21
<i>Rubus argutus</i>	Florida blackberry	0.808417	1.00	0.442982	0.685080	22
<i>Chromolaena odorata</i>	Siam weed, chromolaena	0.789234	1.00	0.446929	0.684988	23
<i>Cabomba caroliniana</i>	Cabomba	0.620155	1.00	0.481313	0.683954	24
<i>Sagittaria pygmaea</i>	Dwarf arrowhead	0.683469	1.00	0.454599	0.676592	25
<i>Onopordum nervosum</i>	Cotton thistle	0.596175	1.00	0.468505	0.673904	26
<i>Fallopia japonica</i> , <i>Fallopia sachalinensis</i>	Japanese and Giant knotweed	0.506400	1	0.519638	0.671765	27
<i>Salix nigra</i>	Willows	0.565578	0.85	0.559364	0.670113	28
<i>Rubus rugosus</i>	Keriberry	0.675226	1.00	0.428443	0.660955	29
<i>Centaurea maculosa</i> .	Spotted knapweed	0.754357	0.85	0.501646	0.660445	30
<i>Parthenium hysterophorus</i>	Parthenium Weed	0.825166	1	0.420087	0.654269	31
<i>Nassella trichotoma</i>	Serrated Tussock	0.761536	0.57	0.675277	0.651939	32
<i>Equisetum</i> spp.	Horsetails	0.726000	0.85	0.519638	0.650117	33
<i>Alternanthera philoxeroides</i>	Alligator Weed	0.527352	0.57	0.719621	0.648670	34
<i>Prosopis</i> spp.	Mesquite	0.658431	0.85	0.521093	0.642824	35
<i>Iva axillaris</i>	Poverty Weed	0.538501	1	0.453036	0.638320	36
<i>Mimosa pigra</i>	Mimosa, giant sensitive plant	0.818008	1.00	0.350578	0.634484	37
<i>Salix viminalis</i>	Willows	0.560486	0.85	0.495981	0.634008	38
<i>Rubus fruticosus</i> agg.	Blackberry	0.767146	0.42	0.726464	0.633277	39
<i>Xanthium spinosum</i>	Noogoora Burr/ Californian Burr	0.619536	0.85	0.500315	0.626521	40
<i>Sagittaria montevidensis</i>	Arrowhead	0.683469	0.85	0.454599	0.625592	41
<i>Sagittaria platyphylla</i>	Delta arrowhead	0.683469	0.85	0.454599	0.625592	41
<i>Thunbergia laurifolia</i>	Laurel clock vine	0.440524	1.00	0.415005	0.625266	43
<i>Piptochaetium montevidense</i>	Uruguayan rice grass	0.706617	1.00	0.354400	0.623258	44
<i>Pelargonium alchemilloides</i>	Garden geranium	0.605828	1.00	0.368643	0.619139	45
<i>Miconia</i> spp.	Miconia	0.866385	1.00	0.303706	0.614041	46
<i>Bassia scoparia</i>	Kochia	0.610614	1.00	0.356267	0.612783	47
<i>Praxelis clematidea</i>	Praxelis	0.705095	1.00	0.334863	0.612135	48
<i>Salix x sepulcralis</i> ¹	Willows	0.592031	1.00	0.353359	0.608925	49
<i>Convolvulus arvensis</i>	Bindweed	0.779101	0.85	0.430366	0.606497	50
<i>Onopordum dissectum</i>	Thistle	0.431190	1.00	0.383170	0.606318	51
<i>Echium vulgare</i>	Viper's Bugloss	0.655865	0.85	0.446556	0.600775	52
<i>Gymnocoronis spilanthoides</i>	Senegal tea plant	0.485586	1.00	0.357542	0.598494	53
<i>Salix humboldtiana</i>	Willows	0.500663	1.00	0.339666	0.590293	54
<i>Lagarosiphon major</i>	Lagarosiphon	0.649037	1	0.342517	0.589694	55
<i>Hemerocallis flaccida</i>	Cape Tulip (two-leaf)	0.684162	0.85	0.417379	0.587832	56
<i>Centaurea solstitialis</i>	St. Barnaby's Thistle	0.655091	0.85	0.423400	0.587715	57
<i>Ulex europaeus</i>	Furze/Gorse	0.828248	0.57	0.545087	0.587038	58
<i>Carthamus glaucus</i>	Glaucous star thistle	0.516750	1.00	0.325102	0.584067	59
<i>Calluna vulgaris</i>	Heather	0.674172	1.00	0.289081	0.582786	60
<i>Anredera cordifolia</i>	Madeira vine	0.766046	0.85	0.358456	0.581661	61
<i>Senecio glastifolius</i>	Holly leaved senecio	0.597307	1.00	0.301771	0.580669	62
<i>Lantana camara</i>	Lantana	0.649647	0.42	0.637247	0.577616	63
<i>Acroptilon repens</i>	Hardheads/Russian Knapweed	0.514006	0.85	0.434553	0.577030	64
<i>Disa bracteata</i>	African weed-orchid	0.763497	1.00	0.256714	0.575379	65
<i>Nassella neesiana</i>	Chilean needle grass	0.686622	0.57	0.543816	0.569332	66
<i>Tamarix aphylla</i>	Athel pine, tamarisk	0.673811	0.85	0.355786	0.569097	67
<i>Ambrosia artemisiifolia</i>	Annual ragweed	0.575985	1.00	0.284903	0.568664	68

Noxious Weeds Review; Phase 3a species
Mallee CMA
Ranked relative to Phase 1 & 2 (highlighted in red)

Scientific name	Common name	Invasiveness Score	Regional Dist	Impact Scores	Final Score	RANK
<i>Cirsium arvense</i>	Californian/Perennial Thistle	0.702729	0.71	0.458673	0.568385	69
<i>Annona glabra</i>	Pond apple	0.694802	1.00	0.258663	0.568228	70
<i>Salix x pendulina</i>	Willows	0.586438	1.00	0.276310	0.565106	71
<i>Homeria miniata</i>	Cape Tulip (one-leaf)	0.747658	0.71	0.440860	0.563800	72
<i>Rosa rubiginosa</i>	Sweet Briar	0.793721	0.57	0.508953	0.562660	73
<i>Cytisus scoparius</i>	English Broom	0.734874	0.57	0.520938	0.562310	74
<i>Hypericum canariense</i>	Canary Island St John's wort	0.505525	1.00	0.287333	0.561570	75
<i>Onopordum illyricum</i>	Illyrian Thistle	0.533147	0.85	0.401999	0.561097	76
<i>Datura ferox</i>	Thorn Apple (common)	0.703633	0.71	0.444751	0.560697	77
<i>Datura stramonium</i>	Thorn Apple (longspine)	0.703600	0.71	0.444751	0.560693	78
<i>Datura innoxia</i>	Thorn Apple (recurved)	0.703600	0.71	0.444751	0.560693	78
<i>Salix matsudana</i>	Willows	0.598025	0.85	0.353359	0.558644	80
<i>Alhagi maurorum</i>	Camelthorn	0.569959	0.85	0.386286	0.556715	81
<i>Cuscuta</i> spp.	Dodder	0.734033	0.71	0.429397	0.555746	82
<i>Hypericum triquetrifolium</i>	Tangled Hypericum	0.602251	0.85	0.377231	0.555520	83
<i>Scolymus maculatus</i>	Spotted thistle	0.794014	1.00	0.213592	0.554893	84
<i>Cannabis sativa</i>	Marijuana	0.565385	1	0.297461	0.554424	85
<i>Onopordum acanthium</i>	Scotch/Heraldic Thistle	0.571238	0.85	0.381627	0.554260	86
<i>Allium triquetrum</i>	Angled Onion	0.614461	0.71	0.448094	0.551868	87
<i>Tribulus terrestris</i>	Caltrop	0.606654	0.85	0.368584	0.551205	88
<i>Festuca gautieri</i>	bearskin fescue	0.491440	0.85	0.387816	0.548150	89
<i>Amsinckia</i> spp.	Amsinckia	0.745464	0.85	0.333240	0.548070	90
<i>Cyperus teneristolon</i>	Cyperus	0.732975	1.00	0.205759	0.543182	91
<i>Salpichroa origanifolia</i>	Pampas Lily-of-the-Valley	0.762638	0.85	0.320066	0.542753	92
<i>Opuntia robusta</i>	Wheel Cactus	0.645158	0.85	0.345016	0.542628	93
<i>Senecio pterophorus</i>	African Daisy	0.676556	0.85	0.337358	0.542107	94
<i>Asystasia gangetica</i> ssp. <i>micrantha</i>	Chinese violet	0.593129	1.00	0.230522	0.540268	95
<i>Ambrosia confertiflora</i>	Burr ragweed	0.594088	1.00	0.226697	0.538241	96
<i>Chondrilla juncea</i>	Skeleton Weed	0.742382	0.85	0.315662	0.537856	97
<i>Ailanthus altissima</i>	Tree of Heaven	0.895314	0.57	0.441183	0.536900	98
<i>Cardaria draba</i>	Hoary Cress	0.563497	0.71	0.429138	0.535137	99
<i>Ambrosia psilostachya</i>	Perennial Ragweed	0.489293	0.85	0.364356	0.534755	100
<i>Eragrostis curvula</i>	African Lovegrass	0.715330	0.85	0.314456	0.533935	101
<i>Opuntia stricta</i>	Prickly Pear (drooping)	0.552003	0.85	0.345016	0.531449	102
<i>Lavandula stoechas</i>	Topped Lavender	0.682210	0.85	0.316423	0.531062	103
<i>Cynoglossum creticum</i>	Blue hound's tongue	0.598661	1.00	0.210974	0.529985	104
<i>Marrubium vulgare</i>	Horehound	0.771737	0.57	0.451853	0.528046	105
<i>Lycium ferocissimum</i>	Boxthorn	0.674957	0.57	0.470710	0.526993	106
<i>Centaurea nigra</i>	Black Knapweed	0.641607	0.85	0.317275	0.526667	107
<i>Rubus alceifolius</i>	Giant bramble	0.620743	1.00	0.197677	0.525188	108
<i>Alternanthera pungens</i>	Khaki Weed	0.653479	0.85	0.303604	0.520436	109
<i>Cytisus multiflorus</i>	white Spanish broom	0.517034	0.85	0.330775	0.519278	110
<i>Cestrum parqui</i>	Chilean Cestrum	0.727801	0.71	0.358471	0.515280	111
<i>Conium maculatum</i>	Hemlock	0.665290	0.57	0.446703	0.512388	112
<i>Hypericum humifusum</i>	Trailing St John's wort	0.455230	1.00	0.208817	0.511565	113
<i>Opuntia vulgaris</i>	Prickly Pear (erect)	0.759228	0.71	0.345016	0.511516	114
<i>Sagittaria graminea</i>	Arrowhead	0.586551	0.85	0.298489	0.509540	115
<i>Sida leprosa</i>	Ivy-leaved Sida	0.485639	1	0.234041	0.509339	116
<i>Barleria prionitis</i>	Barleria, porcupine flower	0.700199	1.00	0.150169	0.508118	117
<i>Solanum elaeagnifolium</i>	Silverleaf Nightshade	0.667968	0.71	0.357925	0.507794	118
<i>Trianoptiles solitaria</i>	Subterranean Cape sedge	0.510665	1.00	0.188664	0.506932	119
<i>Koeleruteria elegans</i> ssp. <i>formosensis</i>	Chinese rain tree	0.591073	1.00	0.167702	0.504842	120
<i>Calicotome spinosa</i>	Spiny Broom	0.447135	0.85	0.317558	0.503489	121
<i>Crataegus monogyna</i>	Hawthorn	0.704590	0.42	0.506902	0.502816	122
<i>Spartium junceum</i>	Spanish broom	0.341815	0.85	0.33587	0.501105	123
<i>Dittrichia viscosa</i>	False yellowhead	0.675616	0.85	0.232653	0.500360	124
<i>Scolymus hispanicus</i>	Golden Thistle	0.497723	0.71	0.377717	0.498448	125
<i>Hypericum tetrapterum</i>	St. Peter's Wort	0.552896	0.85	0.284303	0.497557	126
<i>Hypericum calycinum</i>	Large flowered St John's wort	0.553290	0.71	0.338782	0.497513	127
<i>Cenchrus longispinus</i>	Spiny Burr Grass/ Gentle Annie	0.402417	0.85	0.313125	0.495640	128
<i>Onopordum acaulon</i>	Stemless Thistle	0.528267	0.85	0.285015	0.495001	129
<i>Cynara cardunculus</i>	Artichoke Thistle	0.662745	0.57	0.413264	0.493358	130
<i>Echium plantagineum</i>	Paterson's Curse	0.665066	0.57	0.412722	0.493332	131
<i>Onopordum tauricum</i>	Taurian thistle	0.468246	0.71	0.346370	0.491557	132
<i>Ambrosia tenuifolia</i>	Lacy ragweed	0.604084	1.00	0.141134	0.491525	133
<i>Silybum marianum</i>	Variegated Thistle	0.765111	0.57	0.387726	0.491340	134
<i>Centaurea calcitrapa</i>	Star Thistle	0.408196	0.85	0.303943	0.491192	135
<i>Juncus acutus</i>	Spiny Rush	0.516930	0.57	0.438554	0.490022	136

Noxious Weeds Review; Phase 3a species
Mallee CMA
Ranked relative to Phase 1 & 2 (highlighted in red)

Scientific name	Common name	Invasiveness Score	Regional Dist	Impact Scores	Final Score	RANK
<i>Carduus nutans</i>	Nodding Thistle	0.390918	0.85	0.302426	0.488269	137
<i>Physalis viscosa</i>	Prairie Ground Cherry	0.727781	0.71	0.309365	0.487778	138
<i>Genista linifolia</i>	Flax Leaved Broom	0.703726	0.57	0.392163	0.486458	139
<i>Nassella hyalina</i>	cane needle grass	0.503576	0.85	0.267807	0.482401	140
<i>Ibicella lutea</i>	Devil's Claw (yellowflower)	0.616016	0.85	0.241384	0.481097	141
<i>Asparagus asparagoides</i>	bridal creeper	0.782848	0.57	0.361907	0.479010	142
<i>Emex australis</i>	Spiny Emex	0.535113	0.85	0.247396	0.474755	143
<i>Cirsium acarna</i>	Soldier Thistle	0.523968	0.85	0.249563	0.474632	144
<i>Acacia catechu</i>	Cutch tree	0.606058	1.00	0.107969	0.473190	145
<i>Tipuana tipu</i>	Rosewood, tipuana tree	0.454073	1.00	0.140342	0.473080	146
<i>Proboscidea louisianica</i>	Devil's Claw (purpleflower)	0.542172	0.85	0.241384	0.472236	147
<i>Hypericum androsaemum</i>	Tutsan	0.746650	0.71	0.276452	0.471611	148
<i>Solanum rostratum</i>	Buffalo Burr	0.468698	0.85	0.254399	0.470707	149
<i>Carthamus lanatus</i>	Saffron Thistle	0.499430	0.57	0.405518	0.469422	150
<i>Lachenalia reflexa</i>	Yellow Soldier	0.426976	0.71	0.311622	0.467146	151
<i>Carduus tenuiflorus</i> / <i>C. pycnocephalus</i>	Slender/Shore Thistle	0.608219	0.57	0.359060	0.456460	152
<i>Pittosporum undulatum</i>	sweet pittosporum	0.793704	0.57	0.315117	0.454110	153
<i>Genista monspessulana</i>	Cape Broom /Montpellier Broom	0.698418	0.42	0.419839	0.453320	154
<i>Xanthium strumarium</i>	Bathurst Burr	0.585163	0.57	0.356250	0.452120	155
<i>Hedera helix</i>	English ivy	0.745474	0.42	0.387495	0.449254	156
<i>Hypericum perforatum</i>	St. John's Wort	0.660601	0.57	0.334271	0.448864	157
<i>Leucanthemum vulgare</i>	Ox-eye Daisy	0.610238	0.57	0.333108	0.442169	158
<i>Chrysanthemoides monilifera</i>	Boneseed/Bitou Bush	0.799614	0.42	0.375091	0.440405	159
<i>Nassella leucotricha</i>	Texas needle grass	0.627929	0.57	0.326146	0.440393	160
<i>Dittrichia graveolens</i>	Stinkwort	0.607585	0.57	0.319717	0.434352	161
<i>Senecio jacobaea</i>	Ragwort	0.776347	0.42	0.363784	0.431281	162
<i>Vinca major</i>	blue periwinkle	0.703021	0.57	0.289181	0.428704	163
<i>Dipsacus fullonum</i>	Wild Teasel	0.551563	0.57	0.309552	0.421937	164
<i>Allium vineale</i>	Wild Garlic	0.658241	0.57	0.285822	0.421449	165
<i>Melianthus comosus</i>	Tufted Honeyflower	0.492463	0.42	0.394016	0.414144	166
<i>Solanum linnaeanum</i>	Apple of Sodom	0.356227	0.57	0.325025	0.407161	167
<i>Verbascum thapsus</i>	Great Mullein	0.474171	0.57	0.296038	0.405082	168
<i>Watsonia meriana</i> 'Bulbillifera'	Wild Watsonia	0.402004	0.57	0.307647	0.402923	169
<i>Foeniculum vulgare</i>	Fennel	0.574220	0.42	0.326980	0.386415	170
<i>Oxalis pes-caprae</i>	Soursob	0.743995	0.28	0.365451	0.383532	171
<i>Asphodelus fistulosus</i>	Onion Weed	0.539790	0.42	0.328848	0.383330	172
<i>Diploaxis tenuifolia</i>	Sand Rocket/Sand Mustard	0.565974	0.42	0.317803	0.380286	173
<i>Calystegia silvatica</i>	Greater bindweed	0.317991	0.57	0.259324	0.377180	174
<i>Cirsium vulgare</i>	Spear Thistle	0.693549	0.28	0.353660	0.370875	175
<i>Reseda luteola</i>	Wild Mignonette	0.537021	0.57	0.167145	0.340444	176



Noxious Weeds Review; Phase 3a species

Mallee CMA

Present distribution and calculation of potential distribution score

		IPMS		FIS		Regional Estimate			
Common name	Scientific name	# infestations	area of infestation (ha)	# infestations	# infestations	area of infestation	Weight	Estimate based on: regional description, present potential ratio or gut feeling	
Cutch tree	<i>Acacia catechu</i>	0	0.0	0	0	0.100	1.00	PIRVic estimate	
Prickly acacia	<i>Acacia nilotica</i>	0	0.0	0	0	0.100	1.00	PIRVic estimate	
Annual ragweed	<i>Ambrosia artemisiifolia</i>	0	0.0	0	0	1.000	1.00	PIRVic estimate	
Burr ragweed	<i>Ambrosia confertiflora</i>	0	0.0	0	0	1.000	1.00	PIRVic estimate	
Lacy ragweed	<i>Ambrosia tenuifolia</i>	0	0.0	0	0	1.000	1.00	PIRVic estimate	
Pond apple	<i>Annona glabra</i>	0	0.0	0	0	0.100	1.00	PIRVic estimate	
Madeira vine	<i>Anredera cordifolia</i>	0	0.0	0	0	1.000	0.85	PIRVic estimate	
Chinese violet	<i>Asystasia gangetica</i> ssp. <i>micrantha</i>	0	0.0	0	0	0.100	1.00	PIRVic estimate	
Barleria, porcupine flower	<i>Barleria prionitis</i>	0	0.0	0	0	0.100	1.00	PIRVic estimate	
Kochia	<i>Bassia scoparia</i>	0	0.0	0	0	0.100	1.00	PIRVic estimate	
Cabomba	<i>Cabomba caroliniana</i>	0	0.0	0	0	0.100	1.00	PIRVic estimate	
Heather	<i>Calluna vulgaris</i>	0	0.0	0	0	1.000	1.00	PIRVic estimate	
Greater bindweed	<i>Calystegia silvatica</i>	0	0.0	0	0	1.000	0.57	PIRVic estimate	
Glaucous star thistle	<i>Carthamus glaucus</i>	0	0.0	0	0	1.000	1.00	PIRVic estimate	
Spotted knapweed	<i>Centaurea maculosa</i>	0	0.0	0	0	1.000	0.85	PIRVic estimate	
Siam weed, chromolaena	<i>Chromolaena odorata</i>	0	0.0	0	0	0.100	1.00	PIRVic estimate	
Rubber vine	<i>Cryptostegia grandiflora</i>	0	0.0	0	0	0.100	1.00	PIRVic estimate	
Blue hound's tongue	<i>Cynoglossum creticum</i>	0	0.0	0	0	0.100	1.00	PIRVic estimate	
Cyperus	<i>Cyperus teneristolon</i>	0	0.0	0	0	0.100	1.00	PIRVic estimate	
African weed-orchid	<i>Disa bracteata</i>	0	0.0	0	0	1.000	1.00	PIRVic estimate	
False yellowhead	<i>Dittrichia viscosa</i>	0	0.0	0	0	0.100	0.85	PIRVic estimate	
Senegal tea plant	<i>Gymnocoronis spilanthoides</i>	0	0.0	0	0	0.100	1.00	PIRVic estimate	
English ivy	<i>Hedera helix</i>	0	0.0	0	0	1.000	0.42	PIRVic estimate	
Hymenachne, Olive hymenachne	<i>Hymenachne amplexicaulis</i>	0	0.0	0	0	0.100	1.00	PIRVic estimate	
Large flowered St John's wort	<i>Hypericum calycinum</i>	0	0.0	0	0	1.000	0.71	PIRVic estimate	
Canary Island St John's wort	<i>Hypericum canariense</i>	0	0.0	0	0	1.000	1.00	PIRVic estimate	
Trailing St John's wort	<i>Hypericum humifusum</i>	0	0.0	0	0	1.000	1.00	PIRVic estimate	
Chinese rain tree	<i>Koelreuteria elegans</i> ssp. <i>formosana</i>	0	0.0	0	0	1.000	1.00	PIRVic estimate	
Yellow Soldier	<i>Lachenalia reflexa</i>	0	0.0	0	0	1.000	0.71	PIRVic estimate	
Lantana	<i>Lantana camara</i>	0	0.0	0	0	1.000	0.42	Garden infestations	
Miconia	<i>Miconia</i> spp.	0	0.0	0	0	1.000	1.00	PIRVic estimate	
Mimosa, giant sensitive plant	<i>Mimosa pigra</i>	0	0.0	0	0	0.100	1.00	PIRVic estimate	
Thistle	<i>Onopordum dissectum</i>	0	0.0	0	0	0.000	1.00	PIRVic estimate	
Cotton thistle	<i>Onopordum nervosum</i>	0	0.0	0	0	1.000	1.00	PIRVic estimate	
Taurian thistle	<i>Onopordum tauricum</i>	0	0.0	0	0	1.000	0.71	PIRVic estimate	
Tiger pear	<i>Opuntia aurantiaca</i>	0	0.0	0	0	1.000	1.00	PIRVic estimate	
Parkinsonia	<i>Parkinsonia aculeata</i>	0	0.0	0	0	0.100	1.00	PIRVic estimate	
Garden geranium	<i>Pelargonium alchemilloides</i>	0	0.0	0	0	0.100	1.00	PIRVic estimate	
Leaf cactus	<i>Pereskia aculeata</i>	0	0.0	0	0	0.100	1.00	PIRVic estimate	
Uruguayan rice grass	<i>Piptochaetium montevidense</i>	0	0.0	0	0	0.100	1.00	PIRVic estimate	
Praxelis	<i>Praxelis clematidea</i>	0	0.0	0	0	0.100	1.00	PIRVic estimate	
White weeping broom	<i>Retama raetam</i>	0	0.0	0	0	0.100	1.00	PIRVic estimate	
Giant bramble	<i>Rubus alceifolius</i>	0	0.0	0	0	1.000	1.00	PIRVic estimate	
Florida blackberry	<i>Rubus argutus</i>	0	0.0	0	0	1.000	1.00	PIRVic estimate	
Keriberry	<i>Rubus rugosus</i>	0	0.0	0	0	1.000	1.00	PIRVic estimate	
Arrowhead	<i>Sagittaria montevidensis</i>	0	0.0	0	0	1.000	0.85	PIRVic estimate	
Delta arrowhead	<i>Sagittaria platyphylla</i>	0	0.0	0	0	1.000	0.85	PIRVic estimate	
Dwarf arrowhead	<i>Sagittaria pygmaea</i>	0	0.0	0	0	1.000	1.00	PIRVic estimate	
Willows	<i>Salix alba</i>	0	0.0	0	0	0.100	0.85	PIRVic estimate (FIS)	
Willows	<i>Salix cinerea</i>	0	0.0	0	0	0.100	1.00	PIRVic estimate (FIS)	
Willows	<i>Salix fragilis</i>	0	0.0	0	0	0.100	0.85	PIRVic estimate (FIS)	
Willows	<i>Salix humboldtiana</i>	0	0.0	0	0	0.100	1.00	PIRVic estimate (FIS)	
Willows	<i>Salix matsudana</i>	0	0.0	0	0	0.100	0.85	PIRVic estimate (FIS)	
Willows	<i>Salix nigra</i>	0	0.0	0	0	0.100	0.85	PIRVic estimate (FIS)	
Willows	<i>Salix purpurea</i>	0	0.0	0	0	0.100	0.85	PIRVic estimate (FIS)	
Willows	<i>Salix viminalis</i>	0	0.0	0	0	0.100	0.85	PIRVic estimate (FIS)	
Willows	<i>Salix x pendulina</i>	0	0.0	0	0	0.100	1.00	PIRVic estimate (FIS)	
Willows	<i>Salix x rubens</i>	0	0.0	0	0	0.100	0.85	PIRVic estimate (FIS)	
Willows	<i>Salix x sepulcralis</i> ¹	0	0.0	0	0	0.100	1.00	PIRVic estimate (FIS)	
Spotted thistle	<i>Scolymus maculatus</i>	0	0.0	0	0	1.000	1.00	PIRVic estimate	
Holly leaved senecio	<i>Senecio glastifolius</i>	0	0.0	0	0	0.000	1.00	PIRVic estimate	
Athel pine, tamarisk	<i>Tamarix aphylla</i>	0	0.0	0	0	0.100	0.85	PIRVic estimate	
Laurel clock vine	<i>Thunbergia laurifolia</i>	0	0.0	0	0	0.000	1.00	PIRVic estimate	
Rosewood, tipuana tree	<i>Tipuana tipu</i>	0	0.0	0	0	0.000	1.00	PIRVic estimate	
Subterranean Cape sedge	<i>Trianoptiles solitaria</i>	0	0.0	0	0	0.000	1.00	PIRVic estimate	



Return to map

Noxious Weeds Review; Phase 3a species
Mallee CMA
Potential distribution by landuse and public land

Common name	Scientific name	Potential area* infested by landuse type						Potential total area
		Horticulture	Broadacre cropping	Forestry	Pasture dryland	Pasture irrigated	Public land	
Cutch tree	<i>Acacia catechu</i>	0	0	0	0	0	0	0
Prickly acacia	<i>Acacia nilotica</i>	0	0	0	0	1,260	1,096,500	1,097,760
Annual ragweed	<i>Ambrosia artemisiifolia</i>	39,657	2,031,963	0	0	1,260	0	2,072,880
Burr ragweed	<i>Ambrosia confertiflora</i>	0	2,031,963	0	0	1,260	0	2,033,223
Lacy ragweed	<i>Ambrosia tenuifolia</i>	0	0	0	0	0	0	0
Pond apple	<i>Annona glabra</i>	0	0	0	0	0	0	0
Madeira vine	<i>Anredera cordifolia</i>	0	0	0	0	0	135,900	135,900
Chinese violet	<i>Asystasia gangetica ssp. micrantha</i>	0	0	0	0	0	0	0
Barleria, porcupine flower	<i>Barleria prionitis</i>	0	0	0	0	0	0	0
Kochia	<i>Bassia scoparia</i>	0	2,032,000	0	0	0	1,053,200	3,085,200
Cabomba	<i>Cabomba caroliniana</i>	0	0	0	0	0	134,500	134,500
Heather	<i>Calluna vulgaris</i>	0	0	0	0	0	0	0
Greater bindweed	<i>Calystegia silvatica</i>	9,341	0	0	0	0	0	9,341
Glaucous star thistle	<i>Carthamus glaucus</i>	0	2,031,962	0	0	0	0	2,031,962
Spotted knapweed	<i>Centaurea maculosa</i>	0	0	0	0	300	306,100	306,400
Siam weed, chromolaena	<i>Chromolaena odorata</i>	0	0	0	0	0	0	0
Rubber vine	<i>Cryptostegia grandiflora</i>	0	0	0	0	0	0	0
Blue hound's tongue	<i>Cynoglossum creticum</i>	39,657	0	0	0	0	1,096,500	1,136,157
Cyperus	<i>Cyperus teneristolon</i>	39,657	2,031,963	0	0	1,260	1,308,931	3,381,811
African weed-orchid	<i>Disa bracteata</i>	0	0	0	0	1,260	1,480,706	1,481,966
False yellowhead	<i>Dittrichia viscosa</i>	0	0	0	0	261	15,969	16,230
Senegal tea plant	<i>Gymnocoronis spilanthoides</i>	0	0	0	0	1,260	214,000	215,260
English ivy	<i>Hedera helix</i>	0	0	0	0	0	171,775	171,775
Hymenachne, Olive hymenachne	<i>Hymenachne amplexicaulis</i>	0	0	0	0	0	0	0
Large flowered St John's wort	<i>Hypericum calycinum</i>	0	0	0	0	593	58,907	59,500
Canary Island St John's wort	<i>Hypericum canariense</i>	0	0	0	0	0	0	0
Trailing St John's wort	<i>Hypericum humifusum</i>	0	0	0	0	0	0	0
Chinese rain tree	<i>Koelreuteria elegans ssp. formosana</i>	0	0	0	0	0	0	0
Yellow Soldier	<i>Lachenalia reflexa</i>	0	0	0	0	0	35,210	35,210
Lantana	<i>Lantana camara</i>	0	0	0	0	1,260	79,200	80,460
Miconia	<i>Miconia spp.</i>	0	0	0	0	0	0	0
Mimosa, giant sensitive plant	<i>Mimosa pigra</i>	0	0	0	0	0	0	0
Thistle	<i>Onopordum dissectum</i>							N/A
Cotton thistle	<i>Onopordum nervosum</i>	39,657	0	0	0	0	1,308,931	1,348,588
Taurian thistle	<i>Onopordum tauricum</i>	0	0	0	0	1,260	79,204	80,464
Tiger pear	<i>Opuntia aurantiaca</i>	0	0	0	0	0	1,096,462	1,096,462
Parkinsonia	<i>Parkinsonia aculeata</i>	0	0	0	0	0	1,132,600	1,132,600
Garden geranium	<i>Pelargonium alchemilloides</i>	0	0	0	0	1,260	1,053,205	1,054,465
Leaf cactus	<i>Pereskia aculeata</i>	0	0	0	0	0	0	0
Uruguayan rice grass	<i>Piptochaetium montevidense</i>	0	356,200	0	0	0	0	356,200
Praxelis	<i>Praxelis clematidea</i>	0	0	0	0	0	0	0
White weeping broom	<i>Retama raetam</i>	0	0	0	0	0	1,053,205	1,053,205
Giant bramble	<i>Rubus alceifolius</i>	0	0	0	0	0	0	0
Florida blackberry	<i>Rubus argutus</i>	0	0	0	0	0	0	0
Keriberry	<i>Rubus rugosus</i>	0	0	0	0	0	0	0
Arrowhead	<i>Sagittaria montevidensis</i>	0	0	0	0	1,260	212,900	214,160
Delta arrowhead	<i>Sagittaria platyphylla</i>	0	0	0	0	1,260	213,700	214,960
Dwarf arrowhead	<i>Sagittaria pygmaea</i>	0	0	0	0	0	0	0
Willows	<i>Salix alba</i>	0	0	0	0	0	79,443	79,443
Willows	<i>Salix cinerea</i>	0	0	0	0	0	121,720	121,720
Willows	<i>Salix fragilis</i>	0	0	0	0	0	79,443	79,443
Willows	<i>Salix humboltiana</i>	0	0	0	0	0	0	0
Willows	<i>Salix matsudana</i>	0	0	0	0	0	48,214	48,214
Willows	<i>Salix nigra</i>	0	0	0	0	0	79,443	79,443
Willows	<i>Salix purpurea</i>	0	0	0	0	0	79,443	79,443
Willows	<i>Salix viminalis</i>	0	0	0	0	0	79,443	79,443
Willows	<i>Salix x pendulina</i>	0	0	0	0	0	0	0
Willows	<i>Salix x rubens</i>	0	0	0	0	0	79,443	79,443
Willows	<i>Salix x sepulcralis</i> ¹	0	0	0	0	0	0	0
Spotted thistle	<i>Scolymus maculatus</i>	0	2,031,963	0	0	1,260	1,017,258	3,050,481
Holly leaved senecio	<i>Senecio glastifolius</i>	0	0	0	0	0	4	4
Athel pine, tamarisk	<i>Tamarix aphylla</i>	0	0	0	0	0	79,443	79,443
Laurel clock vine	<i>Thunbergia laurifolia</i>	0	0	0	0	0	0	0
Rosewood, tipuana tree	<i>Tipuana tipu</i>	0	0	0	0	0	0	0
Subterranean Cape sedge	<i>Trianoptiles solitaria</i>	0	0	0	0	0	0	0

*unit of measure is hectare
N/A = not available (too few data)
¹ includes *S. x chrysocoma*

Noxious Weeds Review; Phase 3a species
North Central CMA
Regional score and rank

Scientific name	Common name	Inv. Score	Regional dist.	Impact Score	Regional score	Regional rank	Rank Relative to Phase 1*
<i>Acacia catechu</i>	Cutch tree	0.6061	1.00	0.1080	0.4732	58	142
<i>Acacia nilotica</i>	Prickly acacia	0.5744	1.00	0.5345	0.7082	6	7
<i>Ambrosia artemisiifolia</i>	Annual ragweed	0.5760	1.00	0.2849	0.5687	37	63
<i>Ambrosia confertiflora</i>	Burr ragweed	0.5941	1.00	0.2267	0.5382	47	93
<i>Ambrosia tenuifolia</i>	Lacy ragweed	0.6041	0.85	0.1411	0.4405	65	159
<i>Annona glabra</i>	Pond apple	0.6948	1.00	0.2587	0.5682	38	65
<i>Anredera cordifolia</i>	Madeira vine	0.7660	0.85	0.3585	0.5817	34	58
<i>Asystasia gangetica</i> ssp. <i>micrantha</i>	Chinese violet	0.5931	0.85	0.2305	0.4893	57	133
<i>Barleria prionitis</i>	Barleria, porcupine flower	0.7002	1.00	0.1502	0.5081	55	118
<i>Bassia scoparia</i>	Kochia	0.6106	1.00	0.3563	0.6128	26	44
<i>Cabomba caroliniana</i>	Cabomba	0.6202	0.85	0.4813	0.6330	17	34
<i>Calluna vulgaris</i>	Heather	0.6742	1.00	0.2891	0.5828	33	57
<i>Calystegia silvatica</i>	Greater bindweed	0.3180	0.85	0.2593	0.4724	60	144
<i>Carthamus glaucus</i>	Glaucous star thistle	0.5168	1.00	0.3251	0.5841	32	56
<i>Centaurea maculosa</i>	Spotted knapweed	0.7544	0.85	0.5016	0.6604	14	24
<i>Chromolaena odorata</i>	Siam weed, chromolaena	0.7892	1.00	0.4469	0.6850	10	19
<i>Cryptostegia grandiflora</i>	Rubber vine	0.7574	1.00	0.4880	0.7042	8	9
<i>Cynoglossum creticum</i>	Blue hound's tongue	0.5987	1.00	0.2110	0.5300	48	101
<i>Cyperus teneristolon</i>	Cyperus	0.7330	1.00	0.2058	0.5432	45	88
<i>Disa bracteata</i>	African weed-orchid	0.7635	0.85	0.2567	0.5244	51	107
<i>Dittrichia viscosa</i>	False yellowhead	0.6756	1.00	0.2327	0.5514	42	82
<i>Gymnocoronis spilanthoides</i>	Senegal tea plant	0.4856	0.85	0.3575	0.5475	43	86
<i>Hedera helix</i>	English ivy	0.7455	0.42	0.3875	0.4493	64	156
<i>Hymenachne amplexicaulis</i>	Hymenachne, Olive hymenachne	0.6675	1.00	0.6456	0.7816	1	1
<i>Hypericum calycinum</i>	Large flowered St John's wort	0.5533	0.85	0.3388	0.5451	44	87
<i>Hypericum canariense</i>	Canary Island St John's wort	0.5055	0.85	0.2873	0.5106	54	115
<i>Hypericum humifusum</i>	Trailing St John's wort	0.4552	0.85	0.2088	0.4606	62	150
<i>Koeleruteria elegans</i> ssp. <i>formosana</i>	Chinese rain tree	0.5911	1.00	0.1677	0.5048	56	120
<i>Lachenalia reflexa</i>	Yellow Soldier	0.4270	1.00	0.3116	0.5657	39	66
<i>Lantana camara</i>	Lantana	0.6496	0.42	0.6372	0.5776	35	59
<i>Miconia</i> spp.	Miconia	0.8664	1.00	0.3037	0.6140	25	43
<i>Mimosa pigra</i>	Mimosa, giant sensitive plant	0.8180	1.00	0.3506	0.6345	15	31
<i>Onopordum dissectum</i>	Thistle	0.4312	1.00	0.3832	0.6063	29	48
<i>Onopordum nervosum</i>	Cotton thistle	0.5962	0.85	0.4685	0.6229	22	40
<i>Onopordum tauricum</i>	Taurian thistle	0.4682	0.85	0.3464	0.5392	46	92
<i>Opuntia aurantiaca</i>	Tiger pear	0.6516	0.85	0.6580	0.7357	4	4
<i>Parkinsonia aculeata</i>	Parkinsonia	0.6416	1.00	0.5568	0.7288	5	5
<i>Pelargonium alchemilloides</i>	Garden geranium	0.6058	1.00	0.3686	0.6191	23	41
<i>Pereskia aculeata</i>	Leaf cactus	0.7889	0.71	0.7331	0.7466	2	2
<i>Piptochaetium montevidense</i>	Uruguayan rice grass	0.7066	1.00	0.3544	0.6233	21	39
<i>Praxelis clematidea</i>	Praxelis	0.7051	1.00	0.3349	0.6121	27	45
<i>Retama raetam</i>	White weeping broom	0.6883	1.00	0.5053	0.7056	7	8
<i>Rubus alceifolius</i>	Giant bramble	0.6207	1.00	0.1977	0.5252	50	106
<i>Rubus argutus</i>	Florida blackberry	0.8084	1.00	0.4430	0.6851	9	18
<i>Rubus rugosus</i>	Keriberry	0.6752	0.57	0.4284	0.5148	52	111
<i>Sagittaria montevidensis</i>	Arrowhead	0.6835	0.85	0.4546	0.6256	18	36
<i>Sagittaria platyphylla</i>	Delta arrowhead	0.6835	0.85	0.4546	0.6256	18	36
<i>Sagittaria pygmaea</i>	Dwarf arrowhead	0.6835	1.00	0.4546	0.6766	12	21
<i>Salix alba</i>	Willows	0.5995	0.57	0.5951	0.5990	30	50
<i>Salix cinerea</i>	Willows	0.9190	0.57	0.6668	0.6775	11	20
<i>Salix fragilis</i>	Willows	0.5141	0.57	0.6283	0.6073	28	46
<i>Salix humboltiana</i>	Willows	0.5007	1.00	0.3397	0.5903	31	51
<i>Salix matsudana</i>	Willows	0.5980	0.71	0.3534	0.5110	53	114
<i>Salix nigra</i>	Willows	0.5656	0.85	0.5594	0.6701	13	23
<i>Salix purpurea</i>	Willows	0.7995	0.85	0.6302	0.7378	3	3
<i>Salix viminalis</i>	Willows	0.5605	0.85	0.4960	0.6340	16	32
<i>Salix x pendulina</i>	Willows	0.5864	0.71	0.2763	0.4665	61	149
<i>Salix x rubens</i>	Willows	0.6057	0.57	0.6283	0.6183	24	42
<i>Salix x sepulcralis</i> ¹	Willows	0.5920	0.85	0.3534	0.5579	40	74

Noxious Weeds Review; Phase 3a species
North Central CMA
Regional score and rank

Scientific name	Common name	Inv. Score	Regional dist.	Impact Score	Regional score	Regional rank	Rank Relative to Phase 1*
<i>Scolymus maculatus</i>	Spotted thistle	0.7940	1.00	0.2136	0.5549	41	78
<i>Senecio glastifolius</i>	Holly leaved senecio	0.5973	0.85	0.3018	0.5297	49	102
<i>Tamarix aphylla</i>	Athel pine, tamarisk	0.6738	0.85	0.3558	0.5691	36	62
<i>Thunbergia laurifolia</i>	Laurel clock vine	0.4405	1.00	0.4150	0.6253	20	38
<i>Tipuana tipu</i>	Rosewood, tipuana tree	0.4541	1.00	0.1403	0.4731	59	143
<i>Trianoptiles solitaria</i>	Subterranean Cape sedge	0.5107	0.85	0.1887	0.4559	63	152



Noxious Weeds Review Phase 3a species
North Central CMA
Ranked relative to Phase 1 & 2 (highlighted in red)

Scientific name	Common name	Invasiveness Score	Regional Dist	Impact Scores	Final Score	RANK
<i>Hymenachne amplexicaulis</i>	Hymenachne, Olive hymenachne	0.667534	1.00	0.645600	0.781640	1
<i>Pereskia aculeata</i>	Leaf cactus	0.788886	0.71	0.733119	0.746613	2
<i>Salix purpurea</i>	Willows	0.799511	0.85	0.630180	0.737842	3
<i>Opuntia aurantiaca</i>	Tiger pear	0.651556	0.85	0.657976	0.735653	4
<i>Parkinsonia aculeata</i>	Parkinsonia	0.641562	1.00	0.556809	0.728801	5
<i>Eichhornia crassipes</i>	Water Hyacinth	0.879335	1	0.527622	0.720989	6
<i>Acacia nilotica</i>	Prickly acacia	0.574417	1.00	0.534471	0.708234	7
<i>Retama raetam</i>	White weeping broom	0.688328	1.00	0.505316	0.705576	8
<i>Cryptostegia grandiflora</i>	Rubber vine	0.757375	1.00	0.488003	0.704167	9
<i>Orobanche ramosa</i>	Branched Broomrape	0.769900	1	0.519638	0.703385	10
<i>Pennisetum macrourum</i>	African Feather Grass	0.612026	0.85	0.627185	0.696667	11
<i>Acacia erioloba</i>	Giraffe thorn	0.700000	1	0.519638	0.694997	12
<i>Hieracium spp.</i>	Hawkweeds	0.700000	1	0.519638	0.694997	12
<i>Nassella tenuissima</i>	Mexican feather grass	0.700000	1	0.519638	0.694997	12
<i>Acacia karroo</i>	Karoo thorn	0.670000	1	0.519638	0.691397	15
<i>Nassella charruana</i>	Lobed needle grass	0.650000	1	0.519638	0.688997	16
<i>Salvinia molesta</i>	Salvinia	0.587464	1	0.529090	0.686786	17
<i>Rubus argutus</i>	Florida blackberry	0.808417	1.00	0.442982	0.685080	18
<i>Chromolaena odorata</i>	Siam weed, chromolaena	0.789234	1.00	0.446929	0.684988	19
<i>Salix cinerea</i>	Willows	0.919002	0.57	0.666778	0.677476	20
<i>Sagittaria pygmaea</i>	Dwarf arrowhead	0.683469	1.00	0.454599	0.676592	21
<i>Fallopia japonica, Fallopia sachalinensi</i>	Japanese and Giant knotweed	0.506400	1	0.519638	0.671765	22
<i>Salix nigra</i>	Willows	0.565578	0.85	0.559364	0.670113	23
<i>Centaurea maculosa .</i>	Spotted knapweed	0.754357	0.85	0.501646	0.660445	24
<i>Parthenium hysterophorus</i>	Parthenium Weed	0.825166	1	0.420087	0.654269	25
<i>Nassella trichotoma</i>	Serrated Tussock	0.761536	0.57	0.675277	0.651939	26
<i>Equisetum spp.</i>	Horsetails	0.726000	0.85	0.519638	0.650117	27
<i>Alternanthera philoxeroides</i>	Alligator Weed	0.527352	0.57	0.719621	0.648670	28
<i>Prosopis spp.</i>	Mesquite	0.658431	0.85	0.521093	0.642824	29
<i>Iva axillaris</i>	Poverty Weed	0.538501	1	0.453036	0.638320	30
<i>Mimosa pigra</i>	Mimosa, giant sensitive plant	0.818008	1.00	0.350578	0.634484	31
<i>Salix viminalis</i>	Willows	0.560486	0.85	0.495981	0.634008	32
<i>Rubus fruticosus agg.</i>	Blackberry	0.767146	0.42	0.726464	0.633277	33
<i>Cabomba caroliniana</i>	Cabomba	0.620155	0.85	0.481313	0.632954	34
<i>Xanthium spinosum</i>	Noogoora Burr/ Californian Burr	0.619536	0.85	0.500315	0.626521	35
<i>Sagittaria montevidensis</i>	Arrowhead	0.683469	0.85	0.454599	0.625592	36
<i>Sagittaria platyphylla</i>	Delta arrowhead	0.683469	0.85	0.454599	0.625592	36
<i>Thunbergia laurifolia</i>	Laurel clock vine	0.440524	1.00	0.415005	0.625266	38
<i>Piptochaetium montevidense</i>	Uruguayan rice grass	0.706617	1.00	0.354400	0.623258	39
<i>Onopordum nervosum</i>	Cotton thistle	0.596175	0.85	0.468505	0.622904	40
<i>Pelargonium alchemilloides</i>	Garden geranium	0.605828	1.00	0.368643	0.619139	41
<i>Salix x rubens</i>	Willows	0.605670	0.57	0.628311	0.618335	42
<i>Miconia spp.</i>	Miconia	0.866385	1.00	0.303706	0.614041	43
<i>Bassia scoparia</i>	Kochia	0.610614	1.00	0.356267	0.612783	44
<i>Praxelis clematidea</i>	Praxelis	0.705095	1.00	0.334863	0.612135	45
<i>Salix fragilis</i>	Willows	0.514090	0.57	0.628311	0.607345	46
<i>Convolvulus arvensis</i>	Bindweed	0.779101	0.85	0.430366	0.606497	47
<i>Onopordum dissectum</i>	Thistle	0.431190	1.00	0.383170	0.606318	48
<i>Echium vulgare</i>	Viper's Bugloss	0.655865	0.85	0.446556	0.600775	49
<i>Salix alba</i>	Willows	0.599482	0.57	0.595056	0.598969	50
<i>Salix humboltiana</i>	Willows	0.500663	1.00	0.339666	0.590293	51
<i>Lagarosiphon major</i>	Lagarosiphon	0.649037	1	0.342517	0.589694	52
<i>Homeria flaccida</i>	Cape Tulip (two-leaf)	0.684162	0.85	0.417379	0.587832	53
<i>Centaurea solstitialis</i>	St. Barnaby's Thistle	0.655091	0.85	0.423400	0.587715	54
<i>Ulex europaeus</i>	Furze/Gorse	0.828248	0.57	0.545087	0.587038	55
<i>Carthamus glaucus</i>	Glaucous star thistle	0.516750	1.00	0.325102	0.584067	56
<i>Calluna vulgaris</i>	Heather	0.674172	1.00	0.289081	0.582786	57
<i>Anredera cordifolia</i>	Madeira vine	0.766046	0.85	0.358456	0.581661	58
<i>Lantana camara</i>	Lantana	0.649647	0.42	0.637247	0.577616	59
<i>Acroptilon repens</i>	Hardheads/Russian Knapweed	0.514006	0.85	0.434553	0.577030	60
<i>Nassella neesiana</i>	Chilean needle grass	0.686622	0.57	0.543816	0.569332	61
<i>Tamarix aphylla</i>	Athel pine, tamarisk	0.673811	0.85	0.355786	0.569097	62
<i>Ambrosia artemisiifolia</i>	Annual ragweed	0.575985	1.00	0.284903	0.568664	63
<i>Cirsium arvense</i>	Californian/Perennial Thistle	0.702729	0.71	0.458673	0.568385	64
<i>Annona glabra</i>	Pond apple	0.694802	1.00	0.258663	0.568228	65
<i>Lachenalia reflexa</i>	Yellow Soldier	0.426976	1.00	0.311622	0.565746	66
<i>Homeria miniata</i>	Cape Tulip (one-leaf)	0.747658	0.71	0.440860	0.563800	67
<i>Rosa rubiginosa</i>	Sweet Briar	0.793721	0.57	0.508953	0.562660	68

Noxious Weeds Review Phase 3a species
North Central CMA
Ranked relative to Phase 1 & 2 (highlighted in red)

Scientific name	Common name	Invasiveness Score	Regional Dist	Impact Scores	Final Score	RANK
<i>Cytisus scoparius</i>	English Broom	0.734874	0.57	0.520938	0.562310	69
<i>Onopordum illyricum</i>	Illyrian Thistle	0.533147	0.85	0.401999	0.561097	70
<i>Datura ferox</i>	Thorn Apple (common)	0.703633	0.71	0.444751	0.560697	71
<i>Datura stramonium</i>	Thorn Apple (longspine)	0.703600	0.71	0.444751	0.560693	72
<i>Datura inoxia</i>	Thorn Apple (recurved)	0.703600	0.71	0.444751	0.560693	72
<i>Salix x sepulcralis</i>	Willows	0.592031	0.85	0.353359	0.557925	74
<i>Alhagi maurorum</i>	Camelthorn	0.569959	0.85	0.386286	0.556715	75
<i>Cuscuta</i> spp.	Dodder	0.734033	0.71	0.429397	0.555746	76
<i>Hypericum triquetrifolium</i>	Tangled Hypericum	0.602251	0.85	0.377231	0.555520	77
<i>Scolymus maculatus</i>	Spotted thistle	0.794014	1.00	0.213592	0.554893	78
<i>Cannabis sativa</i>	Marijuana	0.565385	1	0.297461	0.554424	79
<i>Onopordum acanthium</i>	Scotch/Heraldic Thistle	0.571238	0.85	0.381627	0.554260	80
<i>Allium triquetrum</i>	Angled Onion	0.614461	0.71	0.448094	0.551868	81
<i>Dittrichia viscosa</i>	False yellowhead	0.675616	1.00	0.232653	0.551360	82
<i>Tribulus terrestris</i>	Caltrop	0.606654	0.85	0.368584	0.551205	83
<i>Festuca gautieri</i>	bearskin fescue	0.491440	0.85	0.387816	0.548150	84
<i>Amsinckia</i> spp.	Amsinckia	0.745464	0.85	0.333240	0.548070	85
<i>Gymnocoronis spilanthoides</i>	Senegal tea plant	0.485586	0.85	0.357542	0.547494	86
<i>Hypericum calycinum</i>	Large flowered St John's wort	0.553290	0.85	0.338782	0.545113	87
<i>Cyperus teneristolon</i>	Cyperus	0.732975	1.00	0.205759	0.543182	88
<i>Salpichroa origanifolia</i>	Pampas Lily-of-the-Valley	0.762638	0.85	0.320066	0.542753	89
<i>Opuntia robusta</i>	Wheel Cactus	0.645158	0.85	0.345016	0.542628	90
<i>Senecio pterophorus</i>	African Daisy	0.676556	0.85	0.337358	0.542107	91
<i>Onopordum tauricum</i>	Taurian thistle	0.468246	0.85	0.346370	0.539157	92
<i>Ambrosia confertiflora</i>	Burr ragweed	0.594088	1.00	0.226697	0.538241	93
<i>Chondrilla juncea</i>	Skeleton Weed	0.742382	0.85	0.315662	0.537856	94
<i>Ailanthus altissima</i>	Tree of Heaven	0.895314	0.57	0.441183	0.536900	95
<i>Cardaria draba</i>	Hoary Cress	0.563497	0.71	0.429138	0.535137	96
<i>Ambrosia psilostachya</i>	Perennial Ragweed	0.489293	0.85	0.364356	0.534755	97
<i>Eragrostis curvula</i>	African Lovegrass	0.715330	0.85	0.314456	0.533935	98
<i>Opuntia stricta</i>	Prickly Pear (drooping)	0.552003	0.85	0.345016	0.531449	99
<i>Lavandula stoechas</i>	Topped Lavender	0.682210	0.85	0.316423	0.531062	100
<i>Cynoglossum creticum</i>	Blue hound's tongue	0.598661	1.00	0.210974	0.529985	101
<i>Senecio glastifolius</i>	Holly leaved senecio	0.597307	0.85	0.301771	0.529669	102
<i>Marrubium vulgare</i>	Horehound	0.771737	0.57	0.451853	0.528046	103
<i>Lycium ferocissimum</i>	Boxthorn	0.674957	0.57	0.470710	0.526993	104
<i>Centaurea nigra</i>	Black Knapweed	0.641607	0.85	0.317275	0.526667	105
<i>Rubus alceifolius</i>	Giant bramble	0.620743	1.00	0.197677	0.525188	106
<i>Disa bracteata</i>	African weed-orchid	0.763497	0.85	0.256714	0.524379	107
<i>Alternanthera pungens</i>	Khaki Weed	0.653479	0.85	0.303604	0.520436	108
<i>Cytisus multiflorus</i>	white Spanish broom	0.517034	0.85	0.330775	0.519278	109
<i>Cestrum parqui</i>	Chilean Cestrum	0.727801	0.71	0.358471	0.515280	110
<i>Rubus rugosus</i>	Keriberry	0.675226	0.57	0.428443	0.514755	111
<i>Conium maculatum</i>	Hemlock	0.665290	0.57	0.446703	0.512388	112
<i>Opuntia vulgaris</i>	Prickly Pear (erect)	0.759228	0.71	0.345016	0.511516	113
<i>Salix matsudana</i>	Willows	0.598025	0.71	0.353359	0.511044	114
<i>Hypericum canariense</i>	Canary Island St John's wort	0.505525	0.85	0.287333	0.510570	115
<i>Sagittaria graminea</i>	Arrowhead	0.586551	0.85	0.298489	0.509540	116
<i>Sida leprosa</i>	Ivy-leaved Sida	0.485639	1	0.234041	0.509339	117
<i>Barleria prionitis</i>	Barleria, porcupine flower	0.700199	1.00	0.150169	0.508118	118
<i>Solanum elaeagnifolium</i>	Silverleaf Nightshade	0.667968	0.71	0.357925	0.507794	119
<i>Koeleruteria elegans ssp. formos</i>	Chinese rain tree	0.591073	1.00	0.167702	0.504842	120
<i>Calicotome spinosa</i>	Spiny Broom	0.447135	0.85	0.317558	0.503489	121
<i>Crataegus monogyna</i>	Hawthorn	0.704590	0.42	0.506902	0.502816	122
<i>Spartium junceum</i>	Spanish broom	0.341815	0.85	0.33587	0.501105	123
<i>Scolymus hispanicus</i>	Golden Thistle	0.497723	0.71	0.377717	0.498448	124
<i>Hypericum tetrapterum</i>	St. Peter's Wort	0.552896	0.85	0.284303	0.497557	125
<i>Cenchrus longispinus</i>	Spiny Burr Grass/ Gentle Annie	0.402417	0.85	0.313125	0.495640	126
<i>Onopordum acaulon</i>	Stemless Thistle	0.528267	0.85	0.285015	0.495001	127
<i>Cynara cardunculus</i>	Artichoke Thistle	0.662745	0.57	0.413264	0.493358	128
<i>Echium plantagineum</i>	Paterson's Curse	0.665066	0.57	0.412722	0.493332	129
<i>Silybum marianum</i>	Variegated Thistle	0.765111	0.57	0.387726	0.491340	130
<i>Centaurea calcitrapa</i>	Star Thistle	0.408196	0.85	0.303943	0.491192	131
<i>Juncus acutus</i>	Spiny Rush	0.516930	0.57	0.438554	0.490022	132
<i>Asystasia gangetica ssp. micrant</i>	Chinese violet	0.593129	0.85	0.230522	0.489268	133
<i>Carduus nutans</i>	Nodding Thistle	0.390918	0.85	0.302426	0.488269	134
<i>Physalis viscosa</i>	Prairie Ground Cherry	0.727781	0.71	0.309365	0.487778	135
<i>Genista linifolia</i>	Flax Leaved Broom	0.703726	0.57	0.392163	0.486458	136

Noxious Weeds Review Phase 3a species
North Central CMA
Ranked relative to Phase 1 & 2 (highlighted in red)

Scientific name	Common name	Invasiveness Score	Regional Dist	Impact Scores	Final Score	RANK
<i>Nassella hyalina</i>	cane needle grass	0.503576	0.85	0.267807	0.482401	137
<i>Ibicella lutea</i>	Devil's Claw (yellowflower)	0.616016	0.85	0.241384	0.481097	138
<i>Asparagus asparagoides</i>	bridal creeper	0.782848	0.57	0.361907	0.479010	139
<i>Emex australis</i>	Spiny Emex	0.535113	0.85	0.247396	0.474755	140
<i>Cirsium acarna</i>	Soldier Thistle	0.523968	0.85	0.249563	0.474632	141
<i>Acacia catechu</i>	Cutch tree	0.606058	1.00	0.107969	0.473190	142
<i>Tipuana tipu</i>	Rosewood, tipuana tree	0.454073	1.00	0.140342	0.473080	143
<i>Calystegia silvatica</i>	Greater bindweed	0.317991	0.85	0.259324	0.472380	144
<i>Proboscidea louisianica</i>	Devil's Claw (purpleflower)	0.542172	0.85	0.241384	0.472236	145
<i>Hypericum androsaemum</i>	Tutsan	0.746650	0.71	0.276452	0.471611	146
<i>Solanum rostratum</i>	Buffalo Burr	0.468698	0.85	0.254399	0.470707	147
<i>Carthamus lanatus</i>	Saffron Thistle	0.499430	0.57	0.405518	0.469422	148
<i>Salix x pendulina</i>	Willows	0.586438	0.71	0.276310	0.466506	149
<i>Hypericum humifusum</i>	Trailing St John's wort	0.455230	0.85	0.208817	0.460565	150
<i>Carduus tenuiflorus</i> / <i>C. pycnocephalus</i>	Slender/Shore Thistle	0.608219	0.57	0.359060	0.456460	151
<i>Trianoptiles solitaria</i>	Subterranean Cape sedge	0.510665	0.85	0.188664	0.455932	152
<i>Pittosporum undulatum</i>	sweet pittosporum	0.793704	0.57	0.315117	0.454110	153
<i>Genista monspessulana</i>	Cape Broom /Montpellier Broom	0.698418	0.42	0.419839	0.453320	154
<i>Xanthium strumarium</i>	Bathurst Burr	0.585163	0.57	0.356250	0.452120	155
<i>Hedera helix</i>	English ivy	0.745474	0.42	0.387495	0.449254	156
<i>Hypericum perforatum</i>	St. John's Wort	0.660601	0.57	0.334271	0.448864	157
<i>Leucanthemum vulgare</i>	Ox-eye Daisy	0.610238	0.57	0.333108	0.442169	158
<i>Ambrosia tenuifolia</i>	Lacy ragweed	0.604084	0.85	0.141134	0.440525	159
<i>Chrysanthemoides monilifera</i>	Boneseed/Bitou Bush	0.799614	0.42	0.375091	0.440405	160
<i>Nassella leucotricha</i>	Texas needle grass	0.627929	0.57	0.326146	0.440393	161
<i>Dittrichia graveolens</i>	Stinkwort	0.607585	0.57	0.319717	0.434352	162
<i>Senecio jacobaea</i>	Ragwort	0.776347	0.42	0.363784	0.431281	163
<i>Vinca major</i>	blue periwinkle	0.703021	0.57	0.289181	0.428704	164
<i>Dipsacus fullonum</i>	Wild Teasel	0.551563	0.57	0.309552	0.421937	165
<i>Allium vineale</i>	Wild Garlic	0.658241	0.57	0.285822	0.421449	166
<i>Melianthus comosus</i>	Tufted Honeyflower	0.492463	0.42	0.394016	0.414144	167
<i>Solanum linnaeanum</i>	Apple of Sodom	0.356227	0.57	0.325025	0.407161	168
<i>Verbascum thapsus</i>	Great Mullein	0.474171	0.57	0.296038	0.405082	169
<i>Watsonia meriana</i> 'Bulbillifera'	Wild Watsonia	0.402004	0.57	0.307647	0.402923	170
<i>Foeniculum vulgare</i>	Fennel	0.574220	0.42	0.326980	0.386415	171
<i>Oxalis pes-caprae</i>	Soursob	0.743995	0.28	0.365451	0.383532	172
<i>Asphodelus fistulosus</i>	Onion Weed	0.539790	0.42	0.328848	0.383330	173
<i>Diplotaxis tenuifolia</i>	Sand Rocket/Sand Mustard	0.565974	0.42	0.317803	0.380286	174
<i>Cirsium vulgare</i>	Spear Thistle	0.693549	0.28	0.353660	0.370875	175
<i>Reseda luteola</i>	Wild Mignonette	0.537021	0.57	0.167145	0.340444	176



[Return to map](#)

Noxious Weeds Review; Phase 3a species
North Central CMA
Present distribution and calculation of potential distribution score

Common name	Scientific name	IPMS		FIS		Regional Estimate		Weight	Estimate based on: regional description, present potential ratio or gut feeling
		# infestations	area of infestation (ha)	# infestations	# infestations	area of infestation	area of infestation		
Cutch tree	<i>Acacia catechu</i>	0	0	0	0	0.100		1.00	PIRVic estimate
Prickly acacia	<i>Acacia nilotica</i>	0	0	0	0	0.100		1.00	PIRVic estimate
Annual ragweed	<i>Ambrosia artemisiifolia</i>	0	0	0	0	1.000		1.00	PIRVic estimate
Burr ragweed	<i>Ambrosia confertiflora</i>	0	0	0	0	1.000		1.00	PIRVic estimate
Lacy ragweed	<i>Ambrosia tenuifolia</i>	0	0	0	0	1.000		0.85	PIRVic estimate
Pond apple	<i>Annona glabra</i>	0	0	0	0	0.100		1.00	PIRVic estimate
Madeira vine	<i>Anredera cordifolia</i>	0	0	0	0	1.000		0.85	PIRVic estimate
Chinese violet	<i>Asystasia gangetica ssp. Micrantha</i>	0	0	0	0	0.100		0.85	PIRVic estimate
Barleria, porcupine flower	<i>Barleria prionitis</i>	0	0	0	0	0.100		1.00	PIRVic estimate
Kochia	<i>Bassia scoparia</i>	0	0	1	0	0.100		1.00	PIRVic estimate
Cabomba	<i>Cabomba caroliniana</i>	0	0	0	0	0.100		0.85	PIRVic estimate
Heather	<i>Calluna vulgaris</i>	0	0	0	0	0.100		1.00	PIRVic estimate
Greater bindweed	<i>Calystegia silvatica</i>	0	0	0	0	1.000		0.85	PIRVic estimate
Glaucous star thistle	<i>Carthamus glaucus</i>	0	0	0	0	1.000		1.00	PIRVic estimate
Spotted knapweed	<i>Centaurea maculosa</i>	0	0	0	0	1.000		0.85	PIRVic estimate
Siam weed, chromolaena	<i>Chromolaena odorata</i>	0	0	0	0	0.100		1.00	PIRVic estimate
Rubber vine	<i>Cryptostegia grandiflora</i>	0	0	0	0	0.100		1.00	PIRVic estimate
Blue hound's tongue	<i>Cynoglossum creticum</i>	0	0	0	0	0.100		1.00	PIRVic estimate
Cyperus	<i>Cyperus teneristolon</i>	0	0	0		0.100		1.00	PIRVic estimate
African weed-orchid	<i>Disa bracteata</i>	0	0	3	2	10.000		0.85	2 sites Eppalock and Clunes, only 1 plant found at Clunes site
False yellowhead	<i>Dittrichia viscosa</i>	0	0	0	0	0.100		1.00	PIRVic estimate
Senegal tea plant	<i>Gymnocoronis spilanthoides</i>	0	0	0	1	0.250		0.85	Infestation in dam, chemically treated Not sighted in last 3 years
English ivy	<i>Hedera helix</i>	4	2	13	0	2.000		0.42	Not known to be widespread, restricted to gardens, old house sites.
Hymenachne, Olive hymenachne	<i>Hymenachne amplexicaulis</i>	0	0	0	0	0.100		1.00	
Large flowered St John's wort	<i>Hypericum calycinum</i>	0	0	0	0	1.000		0.85	PIRVic estimate
Canary Island St John's wort	<i>Hypericum canariense</i>	0	0	0	0	1.000		0.85	PIRVic estimate
Trailing St John's wort	<i>Hypericum humifusum</i>	0	0	0	0	1.000		0.85	PIRVic estimate
Chinese rain tree	<i>Koeleruteria elegans ssp.formosana</i>	0	0	0	0	0.100		1.00	PIRVic estimate
Yellow Soldier	<i>Lachenalia reflexa</i>	0	0	0	0	0.100		1.00	PIRVic estimate
Lantana	<i>Lantana camara</i>	0	0	0	0	0.100		0.42	PIRVic estimate
Miconia	<i>Miconia spp.</i>	0	0	0	0	1.000		1.00	PIRVic estimate
Mimosa, giant sensitive plant	<i>Mimosa pigra</i>	0	0	0	0	0.100		1.00	PIRVic estimate
Thistle	<i>Onopordum dissectum</i>	0	0	0	0	0.000		1.00	PIRVic estimate
Cotton thistle	<i>Onopordum nervosum</i>	0	0	0	0	1.000		0.85	PIRVic estimate
Taurian thistle	<i>Onopordum tauricum</i>	0	0	0	0	1.000		0.85	PIRVic estimate
Tiger pear	<i>Opuntia aurantiaca</i>	0	0	0	0	1.000		0.85	PIRVic estimate
Parkinsonia	<i>Parkinsonia aculeata</i>	0	0	0	0	0.100		1.00	PIRVic estimate
Garden geranium	<i>Pelargonium alchemilloides</i>	0	0	0	0	0.100		1.00	PIRVic estimate
Leaf cactus	<i>Pereskia aculeata</i>	0	0	0	0	0.100		0.71	PIRVic estimate
Uruguayan rice grass	<i>Piptochaetium montevidense</i>	0	0	0	0	0.100		1.00	PIRVic estimate
Praxelis	<i>Praxelis clematidea</i>	0	0	0	0	0.100		1.00	PIRVic estimate
White weeping broom	<i>Retama raetam</i>	0	0	0	0	0.100		1.00	PIRVic estimate
Giant bramble	<i>Rubus alceifolius</i>	0	0	0	0	1.000		1.00	PIRVic estimate
Florida blackberry	<i>Rubus argutus</i>	0	0	0	0	1.000		1.00	PIRVic estimate
Keriberry	<i>Rubus rugosus</i>	0	0	0	0	1.000		0.57	PIRVic estimate
Arrowhead	<i>Sagittaria montevidensis</i>	0	0	0		1.000		0.85	PIRVic estimate
Delta arrowhead	<i>Sagittaria platyphylla</i>	0	0	41	0	1.000		0.85	PIRVic estimate
Dwarf arrowhead	<i>Sagittaria pygmaea</i>	0	0	0	0	1.000		1.00	PIRVic estimate
Willows	<i>Salix alba</i>	0	0	18		18.000		0.57	Willow spp. widespread throughout NC waterways. Not able to distinguish species
Willows	<i>Salix cinerea</i>	0	0	6		6.000		0.57	PIRVic estimate (FIS)
Willows	<i>Salix fragilis</i>	0	0	8		8.000		0.57	PIRVic estimate (FIS)
Willows	<i>Salix humboldtiana</i>	0	0	0		0.100		1.00	PIRVic estimate (FIS)
Willows	<i>Salix matsudana</i>	0	0	1		1.000		0.71	PIRVic estimate (FIS)
Willows	<i>Salix nigra</i>	0	0	0		0.100		0.85	PIRVic estimate (FIS)
Willows	<i>Salix purpurea</i>	0	0	0		0.100		0.85	PIRVic estimate (FIS)
Willows	<i>Salix viminalis</i>	0	0	0		0.100		0.85	PIRVic estimate (FIS)
Willows	<i>Salix x pendulina</i>	0	0	0		0.100		0.71	PIRVic estimate (FIS)
Willows	<i>Salix x rubens</i>	29	50	37		50.000		0.57	PIRVic estimate (IPMS)
Willows	<i>Salix x sepulcralis</i> ¹	0	0	0		0.100		0.85	PIRVic estimate (FIS)
Spotted thistle	<i>Scolymus maculatus</i>	0	0	0	0	1.000		1.00	PIRVic estimate
Holly leaved senecio	<i>Senecio glastifolius</i>	0	0	0	0	1.000		0.85	PIRVic estimate
Athel pine, tamarisk	<i>Tamarix aphylla</i>	0	0	0	0	0.100		0.85	PIRVic estimate
Laurel clock vine	<i>Thunbergia laurifolia</i>	0	0	0	0	0.000		1.00	PIRVic estimate
Rosewood, tipuana tree	<i>Tipuana tipu</i>	0	0	0	0	0.000		1.00	PIRVic estimate
Subterranean Cape sedge	<i>Trianoptiles solitaria</i>	0	0	0	0	1.000		0.85	PIRVic estimate

¹ includes *S. x chrysocoma*

Noxious Weeds Review; Phase 3a species
North Central CMA
Potential distribution by landuse and public land

Common name	Scientific name	Potential area* infested by landuse type						Potential total area
		Horticulture	Broadacre cropping	Forestry	Pasture dryland	Pasture irrigated	Public land	
Cutch tree	<i>Acacia catechu</i>	0	0	0	0	0	0	0
Prickly acacia	<i>Acacia nilotica</i>	0	0	0	659,188	220,250	139,500	1,018,938
Annual ragweed	<i>Ambrosia artemisiifolia</i>	7,251	1,653,744	0	659,188	220,250	11,866	2,552,299
Burr ragweed	<i>Ambrosia confertiflora</i>		1,653,744	0	659,188	220,250	18,422	2,551,604
Lacy ragweed	<i>Ambrosia tenuifolia</i>	0	0	0	659,188	0	11,866	671,054
Pond apple	<i>Annona glabra</i>	0	0	0	0	0	0	0
Madeira vine	<i>Anredera cordifolia</i>	0	0	6,100	0	0	295,900	302,000
Chinese violet	<i>Asystasia gangetica ssp. micrantha</i>	3,845	2,972	5,209	0	0	0	12,026
Barleria, porcupine flower	<i>Barleria prionitis</i>	0	0	0	0	0	0	0
Kochia	<i>Bassia scoparia</i>	0	1,653,744	0	659,188	0	37,600	2,350,532
Cabomba	<i>Cabomba caroliniana</i>	0	0	0	0	0	90,900	90,900
Heather	<i>Calluna vulgaris</i>	0	0	5,200	271,800	0	2,200	279,200
Greater bindweed	<i>Calystegia silvatica</i>	7,251	0	0	659,188	0	2,322	668,761
Glaucous star thistle	<i>Carthamus glaucus</i>	0	1,653,744	0	582,964	0	2,322	2,239,030
Spotted knapweed	<i>Centaurea maculosa</i>	0	0	0	659,188	174,200	50,200	883,588
Siam weed, chromolaena	<i>Chromolaena odorata</i>	0	0	0	0	0	0	0
Rubber vine	<i>Cryptostegia grandiflora</i>	0	0	0	0	0	0	0
Blue hound's tongue	<i>Cynoglossum creticum</i>	7,300	0	0	659,188	0	324,000	990,488
Cyperus	<i>Cyperus teneristolon</i>	6,368	1,653,744	0	0	218,802	25,984	1,904,898
African weed-orchid	<i>Disa bracteata</i>	0	0	0	659,188	220,250	327,328	1,206,766
False yellowhead	<i>Dittrichia viscosa</i>	0	0	0	659,188	213,924	37,284	910,396
Senegal tea plant	<i>Gymnocoronis spilanthoides</i>	0	0	0	0	220,250	120,700	340,950
English ivy	<i>Hedera helix</i>	0	0	6,072	0	0	302,463	308,535
Hymenachne, Olive hymenachne	<i>Hymenachne amplexicaulis</i>	0	0	0	0	0	0	0
Large flowered St John's wort	<i>Hypericum calycinum</i>	0	0	0	659,188	220,250	55,939	935,377
Canary Island St John's wort	<i>Hypericum canariense</i>	0	0	0	659,188	167,898	9,544	836,630
Trailing St John's wort	<i>Hypericum humifusum</i>	0	143,321	0	545,600	9,800	7,540	706,261
Chinese rain tree	<i>Koelreuteria elegans ssp. formosana</i>	0	0	0	0	0	0	0
Yellow Soldier	<i>Lachenalia reflexa</i>	0	0	0	0	0	0	0
Lantana	<i>Lantana camara</i>	0	0	6,100	659,188	220,250	231,600	1,117,138
Miconia	<i>Miconia spp.</i>	0	0	0	0	0	0	0
Mimosa, giant sensitive plant	<i>Mimosa pigra</i>	0	0	0	0	0	0	0
Thistle	<i>Onopordum dissectum</i>	0						N/A
Cotton thistle	<i>Onopordum nervosum</i>	7,251	0	0	659,188	0	48,106	714,545
Taurian thistle	<i>Onopordum tauricum</i>	0	0	0	659,188	220,250	49,383	928,821
Tiger pear	<i>Opuntia aurantiaca</i>	0	0	0	659,188	0	81,743	740,931
Parkinsonia	<i>Parkinsonia aculeata</i>	0	0	0	558,000	0	291,300	849,300
Garden geranium	<i>Pelargonium alchemilloides</i>	0	0	0	659,188	220,250	127,861	1,007,299
Leaf cactus	<i>Pereskia aculeata</i>	0	0	300	0	0	9,300	9,600
Uruguayan rice grass	<i>Piptochaetium montevidense</i>	0	1,471,700	0	659,188	0	23,200	2,154,088
Praxelis	<i>Praxelis clematidea</i>	0	0	0	0	0	0	0
White weeping broom	<i>Retama raetam</i>	0	0	0	659,188	0	54,662	713,850
Giant bramble	<i>Rubus alceifolius</i>	0	0	0	0	0	0	0
Florida blackberry	<i>Rubus argutus</i>	0	0	0	0	0	0	0
Keriberry	<i>Rubus rugosus</i>	0	0	0	0	0	3,261	3,261
Arrowhead	<i>Sagittaria montevidensis</i>	0	0	0	0	220,250	118,000	338,250
Delta arrowhead	<i>Sagittaria platyphylla</i>	0	0	0	0	220,250	118,000	338,250
Dwarf arrowhead	<i>Sagittaria pygmaea</i>	0	0	0	0	0	0	0
Willows	<i>Salix alba</i>	0	0	0	0	0	29,761	29,761
Willows	<i>Salix cinerea</i>	0	0	0	0	0	121,340	29,761
Willows	<i>Salix fragilis</i>	0	0	0	0	0	29,761	29,761
Willows	<i>Salix humboldtiana</i>	0	0	0	0	0	0	0
Willows	<i>Salix matsudana</i>	0	0	0	0	0	29,761	29,761
Willows	<i>Salix nigra</i>	0	0	0	0	0	29,761	29,761
Willows	<i>Salix purpurea</i>	0	0	0	0	0	29,761	29,761
Willows	<i>Salix viminalis</i>	0	0	0	0	0	29,761	29,761
Willows	<i>Salix x pendulina</i>	0	0	0	0	0	1,104	1,104
Willows	<i>Salix x rubens</i>	0	0	0	0	0	29,761	29,761
Willows	<i>Salix x sepulcralis</i> ¹	0	0	0	0	0	14,954	14,954
Spotted thistle	<i>Scolymus maculatus</i>	0	1,653,744	0	557,981	218,802	208,370	2,638,897
Holly leaved senecio	<i>Senecio glastifolius</i>	0	0	0	659,188	42,973	0	702,161
Athel pine, tamarisk	<i>Tamarix aphylla</i>	0	0	0	0	0	29,761	29,761
Laurel clock vine	<i>Thunbergia laurifolia</i>	0	0	0	0	0	0	0
Rosewood, tipuana tree	<i>Tipuana tipu</i>	0	0	0	0	0	0	0
Subterranean Cape sedge	<i>Trianoptiles solitaria</i>	0	0	0	0	153,315	15,893	169,208

*unit of measure is hectare
N/A = Not available (too few data)
¹ includes *S. x chrysocoma*

Noxious Weeds Review; Phase 3a species
North East CMA
Regional score and rank

Scientific name	Common name	Inv. Score	Regional dist.	Impact Score	Regional score	Regional rank	Rank Relative to Phase 1*
<i>Acacia catechu</i>	Cutch tree	0.6061	1.00	0.1080	0.4732	57	141
<i>Acacia nilotica</i>	Prickly acacia	0.5744	1.00	0.5345	0.7082	5	6
<i>Ambrosia artemisiifolia</i>	Annual ragweed	0.5760	0.85	0.2849	0.5177	50	108
<i>Ambrosia confertiflora</i>	Burr ragweed	0.5941	0.85	0.2267	0.4872	56	134
<i>Ambrosia tenuifolia</i>	Lacy ragweed	0.6041	0.85	0.1411	0.4405	63	157
<i>Annona glabra</i>	Pond apple	0.6948	1.00	0.2587	0.5682	37	64
<i>Anredera cordifolia</i>	Madeira vine	0.7660	1.00	0.3585	0.6327	17	34
<i>Asystasia gangetica</i> ssp. <i>micrantha</i>	Chinese violet	0.5931	1.00	0.2305	0.5403	45	91
<i>Barleria prionitis</i>	Barleria, porcupine flower	0.7002	1.00	0.1502	0.5081	52	115
<i>Bassia scoparia</i>	Kochia	0.6106	1.00	0.3563	0.6128	24	42
<i>Cabomba caroliniana</i>	Cabomba	0.6202	0.85	0.4813	0.6330	16	33
<i>Calluna vulgaris</i>	Heather	0.6742	1.00	0.2891	0.5828	30	54
<i>Calystegia silvatica</i>	Greater bindweed	0.3180	0.71	0.2593	0.4248	64	163
<i>Carthamus glaucus</i>	Glaucous star thistle	0.5168	0.85	0.3251	0.5331	47	98
<i>Centaurea maculosa</i>	Spotted knapweed	0.7544	0.85	0.5016	0.6604	12	22
<i>Chromolaena odorata</i>	Siam weed, chromolaena	0.7892	1.00	0.4469	0.6850	9	18
<i>Cryptostegia grandiflora</i>	Rubber vine	0.7574	1.00	0.4880	0.7042	7	8
<i>Cynoglossum creticum</i>	Blue hound's tongue	0.5987	1.00	0.2110	0.5300	48	101
<i>Cyperus teneristolon</i>	Cyperus	0.7330	0.85	0.2058	0.4922	55	128
<i>Disa bracteata</i>	African weed-orchid	0.7635	1.00	0.2567	0.5754	35	60
<i>Dittrichia viscosa</i>	False yellowhead	0.6756	1.00	0.2327	0.5514	42	82
<i>Gymnocoronis spilanthoides</i>	Senegal tea plant	0.4856	0.85	0.3575	0.5475	43	86
<i>Hedera helix</i>	English ivy	0.7455	0.42	0.3875	0.4493	62	154
<i>Hymenachne amplexicaulis</i>	Hymenachne, Olive hymenachne	0.6675	1.00	0.6456	0.7816	3	3
<i>Hypericum calycinum</i>	Large flowered St John's wort	0.5533	0.85	0.3388	0.5451	44	87
<i>Hypericum canariense</i>	Canary Island St John's wort	0.5055	0.85	0.2873	0.5106	51	112
<i>Hypericum humifusum</i>	Trailing St John's wort	0.4552	0.85	0.2088	0.4606	60	148
<i>Koeleruteria elegans</i> ssp. <i>formosana</i>	Chinese rain tree	0.5911	1.00	0.1677	0.5048	53	117
<i>Lachenalia reflexa</i>	Yellow Soldier	0.4270	1.00	0.3116	0.5657	38	65
<i>Lantana camara</i>	Lantana	0.6496	0.42	0.6372	0.5776	34	58
<i>Miconia</i> spp.	Miconia	0.8664	1.00	0.3037	0.6140	23	41
<i>Mimosa pigra</i>	Mimosa, giant sensitive plant	0.8180	1.00	0.3506	0.6345	14	30
<i>Onopordum dissectum</i>	Thistle	0.4312	1.00	0.3832	0.6063	27	46
<i>Onopordum nervosum</i>	Cotton thistle	0.5962	0.85	0.4685	0.6229	20	38
<i>Onopordum tauricum</i>	Taurian thistle	0.4682	0.85	0.3464	0.5392	46	92
<i>Opuntia aurantiaca</i>	Tiger pear	0.6516	1.00	0.6580	0.7867	2	2
<i>Parkinsonia aculeata</i>	Parkinsonia	0.6416	1.00	0.5568	0.7288	4	4
<i>Pelargonium alchemilloides</i>	Garden geranium	0.6058	1.00	0.3686	0.6191	21	39
<i>Pereskia aculeata</i>	Leaf cactus	0.7889	0.85	0.7331	0.7942	1	1
<i>Piptochaetium montevidense</i>	Uruguayan rice grass	0.7066	1.00	0.3544	0.6233	19	37
<i>Praxelis clematidea</i>	Praxelis	0.7051	1.00	0.3349	0.6121	25	43
<i>Retama raetam</i>	White weeping broom	0.6883	1.00	0.5053	0.7056	6	7
<i>Rubus alceifolius</i>	Giant bramble	0.6207	1.00	0.1977	0.5252	49	105
<i>Rubus argutus</i>	Florida blackberry	0.8084	1.00	0.4430	0.6851	8	17
<i>Rubus rugosus</i>	Keriberry	0.6752	0.71	0.4284	0.5624	39	68
<i>Sagittaria montevidensis</i>	Arrowhead	0.6835	0.71	0.4546	0.5780	32	56
<i>Sagittaria platyphylla</i>	Delta arrowhead	0.6835	0.71	0.4546	0.5780	32	56
<i>Sagittaria pygmaea</i>	Dwarf arrowhead	0.6835	1.00	0.4546	0.6766	11	20
<i>Salix alba</i>	Willows	0.5995	0.57	0.5951	0.5990	28	48
<i>Salix cinerea</i>	Willows	0.9190	0.57	0.6668	0.6775	10	19
<i>Salix fragilis</i>	Willows	0.5141	0.57	0.6283	0.6073	26	44
<i>Salix humboltiana</i>	Willows	0.5007	1.00	0.3397	0.5903	29	49
<i>Salix matsudana</i>	Willows	0.5980	0.85	0.3534	0.5586	40	74
<i>Salix nigra</i>	Willows	0.5656	0.57	0.5594	0.5749	36	61
<i>Salix purpurea</i>	Willows	0.7995	0.57	0.6302	0.6426	13	28
<i>Salix viminalis</i>	Willows	0.5605	0.85	0.4960	0.6340	15	31
<i>Salix x pendulina</i>	Willows	0.5864	0.71	0.2763	0.4665	59	147
<i>Salix x rubens</i>	Willows	0.6057	0.57	0.6283	0.6183	22	40
<i>Salix x sepulcralis</i> ¹	Willows	0.5920	0.85	0.3534	0.5579	41	75

Noxious Weeds Review; Phase 3a species
North East CMA
Regional score and rank

Scientific name	Common name	Inv. Score	Regional dist.	Impact Score	Regional score	Regional rank	Rank Relative to Phase 1*
<i>Scolymus maculatus</i>	Spotted thistle	0.7940	0.85	0.2136	0.5039	54	118
<i>Senecio glastifolius</i>	Holly leaved senecio	0.5973	1.00	0.3018	0.5807	31	55
<i>Tamarix aphylla</i>	Athel pine, tamarisk	0.6738	0.42	0.3558	0.4229	65	164
<i>Thunbergia laurifolia</i>	Laurel clock vine	0.4405	1.00	0.4150	0.6253	18	36
<i>Tipuana tipu</i>	Rosewood, tipuana tree	0.4541	1.00	0.1403	0.4731	58	142
<i>Trianoptiles solitaria</i>	Subterranean Cape sedge	0.5107	0.85	0.1887	0.4559	61	150



Noxious Weeds Review
North East CMA
Phase 3a Species: Ranked relative to Phase 1 & 2 (highlighted in red)

Scientific name	Common name	Invasiveness Score	Regional Dist	Impact Scores	Final Score	RANK
<i>Pereskia aculeata</i>	Leaf cactus	0.788886	0.85	0.733119	0.794213	1
<i>Opuntia aurantiaca</i>	Tiger pear	0.651556	1.00	0.657976	0.786653	2
<i>Hymenachne amplexicaulis</i>	Hymenachne, Olive hymenachne	0.667534	1.00	0.645600	0.781640	3
<i>Parkinsonia aculeata</i>	Parkinsonia	0.641562	1.00	0.556809	0.728801	4
<i>Eichhornia crassipes</i>	Water Hyacinth	0.879335	1	0.527622	0.720989	5
<i>Acacia nilotica</i>	Prickly acacia	0.574417	1.00	0.534471	0.708234	6
<i>Retama raetam</i>	White weeping broom	0.688328	1.00	0.505316	0.705576	7
<i>Cryptostegia grandiflora</i>	Rubber vine	0.757375	1.00	0.488003	0.704167	8
<i>Orobanche ramosa</i>	Branched Broomrape	0.769900	1	0.519638	0.703385	9
<i>Pennisetum macrourum</i>	African Feather Grass	0.612026	0.85	0.627185	0.696667	10
<i>Acacia erioloba</i>	Giraffe thorn	0.700000	1	0.519638	0.694997	11
<i>Hieracium spp.</i>	Hawkweeds	0.700000	1	0.519638	0.694997	11
<i>Nassella tenuissima</i>	Mexican feather grass	0.700000	1	0.519638	0.694997	11
<i>Acacia karroo</i>	Karoo thorn	0.670000	1	0.519638	0.691397	14
<i>Nassella charruana</i>	Lobed needle grass	0.650000	1	0.519638	0.688997	15
<i>Salvinia molesta</i>	Salvinia	0.587464	1	0.529090	0.686786	16
<i>Rubus argutus</i>	Florida blackberry	0.808417	1.00	0.442982	0.685080	17
<i>Chromolaena odorata</i>	Siam weed, chromolaena	0.789234	1.00	0.446929	0.684988	18
<i>Salix cinerea</i>	Willows	0.919002	0.57	0.666778	0.677476	19
<i>Sagittaria pygmaea</i>	Dwarf arrowhead	0.683469	1.00	0.454599	0.676592	20
<i>Fallopia japonica, Fallopia sachalinensi</i>	Japanese and Giant knotweed	0.506400	1	0.519638	0.671765	21
<i>Centaurea maculosa .</i>	Spotted knapweed	0.754357	0.85	0.501646	0.660445	22
<i>Parthenium hysterophorus</i>	Parthenium Weed	0.825166	1	0.420087	0.654269	23
<i>Nassella trichotoma</i>	Serrated Tussock	0.761536	0.57	0.675277	0.651939	24
<i>Equisetum spp.</i>	Horsetails	0.726000	0.85	0.519638	0.650117	25
<i>Alternanthera philoxeroides</i>	Alligator Weed	0.527352	0.57	0.719621	0.648670	26
<i>Prosopis spp.</i>	Mesquite	0.658431	0.85	0.521093	0.642824	27
<i>Salix purpurea</i>	Willows	0.799511	0.57	0.630180	0.642642	28
<i>Iva axillaris</i>	Poverty Weed	0.538501	1	0.453036	0.638320	29
<i>Mimosa pigra</i>	Mimosa, giant sensitive plant	0.818008	1.00	0.350578	0.634484	30
<i>Salix viminalis</i>	Willows	0.560486	0.85	0.495981	0.634008	31
<i>Rubus fruticosus agg.</i>	Blackberry	0.767146	0.42	0.726464	0.633277	32
<i>Cabomba caroliniana</i>	Cabomba	0.620155	0.85	0.481313	0.632954	33
<i>Anredera cordifolia</i>	Madeira vine	0.766046	1.00	0.358456	0.632661	34
<i>Xanthium spinosum</i>	Noogoora Burr/ Californian Burr	0.619536	0.85	0.500315	0.626521	35
<i>Thunbergia laurifolia</i>	Laurel clock vine	0.440524	1.00	0.415005	0.625266	36
<i>Piptochaetium montevidense</i>	Uruguayan rice grass	0.706617	1.00	0.354400	0.623258	37
<i>Onopordum nervosum</i>	Cotton thistle	0.596175	0.85	0.468505	0.622904	38
<i>Pelargonium alchemilloides</i>	Garden geranium	0.605828	1.00	0.368643	0.619139	39
<i>Salix x rubens</i>	Willows	0.605670	0.57	0.628311	0.618335	40
<i>Miconia spp.</i>	Miconia	0.866385	1.00	0.303706	0.614041	41
<i>Bassia scoparia</i>	Kochia	0.610614	1.00	0.356267	0.612783	42
<i>Praxelis clematidea</i>	Praxelis	0.705095	1.00	0.334863	0.612135	43
<i>Salix fragilis</i>	Willows	0.514090	0.57	0.628311	0.607345	44
<i>Convolvulus arvensis</i>	Bindweed	0.779101	0.85	0.430366	0.606497	45
<i>Onopordum dissectum</i>	Thistle	0.431190	1.00	0.383170	0.606318	46
<i>Echium vulgare</i>	Viper's Bugloss	0.655865	0.85	0.446556	0.600775	47
<i>Salix alba</i>	Willows	0.599482	0.57	0.595056	0.598969	48
<i>Salix humboldtiana</i>	Willows	0.500663	1.00	0.339666	0.590293	49
<i>Lagarosiphon major</i>	Lagarosiphon	0.649037	1	0.342517	0.589694	50
<i>Homeria flaccida</i>	Cape Tulip (two-leaf)	0.684162	0.85	0.417379	0.587832	51
<i>Centaurea solstitialis</i>	St. Barnaby's Thistle	0.655091	0.85	0.423400	0.587715	52
<i>Ulex europaeus</i>	Furze/Gorse	0.828248	0.57	0.545087	0.587038	53
<i>Calluna vulgaris</i>	Heather	0.674172	1.00	0.289081	0.582786	54
<i>Senecio glastifolius</i>	Holly leaved senecio	0.597307	1.00	0.301771	0.580669	55
<i>Sagittaria montevidensis</i>	Arrowhead	0.683469	0.71	0.454599	0.577992	56
<i>Sagittaria platyphylla</i>	Delta arrowhead	0.683469	0.71	0.454599	0.577992	56
<i>Lantana camara</i>	Lantana	0.649647	0.42	0.637247	0.577616	58
<i>Acroptilon repens</i>	Hardheads/Russian Knapweed	0.514006	0.85	0.434553	0.577030	59
<i>Disa bracteata</i>	African weed-orchid	0.763497	1.00	0.256714	0.575379	60
<i>Salix nigra</i>	Willows	0.565578	0.57	0.559364	0.574913	61
<i>Nassella neesiana</i>	Chilean needle grass	0.686622	0.57	0.543816	0.569332	62
<i>Cirsium arvense</i>	Californian/Perennial Thistle	0.702729	0.71	0.458673	0.568385	63
<i>Annona glabra</i>	Pond apple	0.694802	1.00	0.258663	0.568228	64
<i>Lachenalia reflexa</i>	Yellow Soldier	0.426976	1.00	0.311622	0.565746	65
<i>Homeria miniata</i>	Cape Tulip (one-leaf)	0.747658	0.71	0.440860	0.563800	66
<i>Rosa rubiginosa</i>	Sweet Briar	0.793721	0.57	0.508953	0.562660	67
<i>Rubus rugosus</i>	Keriberry	0.675226	0.71	0.428443	0.562355	68

Noxious Weeds Review
North East CMA
Phase 3a Species: Ranked relative to Phase 1 & 2 (highlighted in red)

Scientific name	Common name	Invasiveness Score	Regional Dist	Impact Scores	Final Score	RANK
<i>Cytisus scoparius</i>	English Broom	0.734874	0.57	0.520938	0.562310	69
<i>Onopordum illyricum</i>	Illyrian Thistle	0.533147	0.85	0.401999	0.561097	70
<i>Datura ferox</i>	Thorn Apple (common)	0.703633	0.71	0.444751	0.560697	71
<i>Datura stramonium</i>	Thorn Apple (longspine)	0.703600	0.71	0.444751	0.560693	72
<i>Datura innoxia</i>	Thorn Apple (recurved)	0.703600	0.71	0.444751	0.560693	72
<i>Salix matsudana</i>	Willows	0.598025	0.85	0.353359	0.558644	74
<i>Salix x sepulcralis</i>¹	Willows	0.592031	0.85	0.353359	0.557925	75
<i>Alhagi maurorum</i>	Camelthorn	0.569959	0.85	0.386286	0.556715	76
<i>Cuscuta spp.</i>	Dodder	0.734033	0.71	0.429397	0.555746	77
<i>Hypericum triquetrifolium</i>	Tangled Hypericum	0.602251	0.85	0.377231	0.555520	78
<i>Cannabis sativa</i>	Marijuana	0.565385	1	0.297461	0.554424	79
<i>Onopordum acanthium</i>	Scotch/Heraldic Thistle	0.571238	0.85	0.381627	0.554260	80
<i>Allium triquetrum</i>	Angled Onion	0.614461	0.71	0.448094	0.551868	81
<i>Dittrichia viscosa</i>	False yellowhead	0.675616	1.00	0.232653	0.551360	82
<i>Tribulus terrestris</i>	Caltrop	0.606654	0.85	0.368584	0.551205	83
<i>Festuca gautieri</i>	bearskin fescue	0.491440	0.85	0.387816	0.548150	84
<i>Amsinckia spp.</i>	Amsinckia	0.745464	0.85	0.333240	0.548070	85
<i>Gymnocoronis spilanthoides</i>	Senegal tea plant	0.485586	0.85	0.357542	0.547494	86
<i>Hypericum calycinum</i>	Large flowered St John's wort	0.553290	0.85	0.338782	0.545113	87
<i>Salpichroa origanifolia</i>	Pampas Lily-of-the-Valley	0.762638	0.85	0.320066	0.542753	88
<i>Opuntia robusta</i>	Wheel Cactus	0.645158	0.85	0.345016	0.542628	89
<i>Senecio pterophorus</i>	African Daisy	0.676556	0.85	0.337358	0.542107	90
<i>Asystasia gangetica ssp. micrantha</i>	Chinese violet	0.593129	1.00	0.230522	0.540268	91
<i>Onopordum tauricum</i>	Taurian thistle	0.468246	0.85	0.346370	0.539157	92
<i>Chondrilla juncea</i>	Skeleton Weed	0.742382	0.85	0.315662	0.537856	93
<i>Ailanthus altissima</i>	Tree of Heaven	0.895314	0.57	0.441183	0.536900	94
<i>Cardaria draba</i>	Hoary Cress	0.563497	0.71	0.429138	0.535137	95
<i>Ambrosia psilostachya</i>	Perennial Ragweed	0.489293	0.85	0.364356	0.534755	96
<i>Eragrostis curvula</i>	African Lovegrass	0.715330	0.85	0.314456	0.533935	97
<i>Carthamus glaucus</i>	Glaucous star thistle	0.516750	0.85	0.325102	0.533067	98
<i>Opuntia stricta</i>	Prickly Pear (drooping)	0.552003	0.85	0.345016	0.531449	99
<i>Lavandula stoechas</i>	Topped Lavender	0.682210	0.85	0.316423	0.531062	100
<i>Cynoglossum creticum</i>	Blue hound's tongue	0.598661	1.00	0.210974	0.529985	101
<i>Marrubium vulgare</i>	Horehound	0.771737	0.57	0.451853	0.528046	102
<i>Lycium ferocissimum</i>	Boxthorn	0.674957	0.57	0.470710	0.526993	103
<i>Centaurea nigra</i>	Black Knapweed	0.641607	0.85	0.317275	0.526667	104
<i>Rubus alceifolius</i>	Giant bramble	0.620743	1.00	0.197677	0.525188	105
<i>Alternanthera pungens</i>	Khaki Weed	0.653479	0.85	0.303604	0.520436	106
<i>Cytisus multiflorus</i>	white Spanish broom	0.517034	0.85	0.330775	0.519278	107
<i>Ambrosia artemisiifolia</i>	Annual ragweed	0.575985	0.85	0.284903	0.517664	108
<i>Cestrum parqui</i>	Chilean Cestrum	0.727801	0.71	0.358471	0.515280	109
<i>Conium maculatum</i>	Hemlock	0.665290	0.57	0.446703	0.512388	110
<i>Opuntia vulgaris</i>	Prickly Pear (erect)	0.759228	0.71	0.345016	0.511516	111
<i>Hypericum canariense</i>	Canary Island St John's wort	0.505525	0.85	0.287333	0.510570	112
<i>Sagittaria graminea</i>	Arrowhead	0.586551	0.85	0.298489	0.509540	113
<i>Sida leprosa</i>	Ivy-leafed Sida	0.485639	1	0.234041	0.509339	114
<i>Barleria prionitis</i>	Barleria, porcupine flower	0.700199	1.00	0.150169	0.508118	115
<i>Solanum elaeagnifolium</i>	Silverleaf Nightshade	0.667968	0.71	0.357925	0.507794	116
<i>Koeleruteria elegans ssp. formosensis</i>	Chinese rain tree	0.591073	1.00	0.167702	0.504842	117
<i>Scolymus maculatus</i>	Spotted thistle	0.794014	0.85	0.213592	0.503893	118
<i>Calicotome spinosa</i>	Spiny Broom	0.447135	0.85	0.317558	0.503489	119
<i>Crataegus monogyna</i>	Hawthorn	0.704590	0.42	0.506902	0.502816	120
<i>Spartium junceum</i>	Spanish broom	0.341815	0.85	0.33587	0.501105	121
<i>Scolymus hispanicus</i>	Golden Thistle	0.497723	0.71	0.377717	0.498448	122
<i>Hypericum tetrapterum</i>	St. Peter's Wort	0.552896	0.85	0.284303	0.497557	123
<i>Cenchrus longispinus</i>	Spiny Burr Grass/ Gentle Annie	0.402417	0.85	0.313125	0.495640	124
<i>Onopordum acaulon</i>	Stemless Thistle	0.528267	0.85	0.285015	0.495001	125
<i>Cynara cardunculus</i>	Artichoke Thistle	0.662745	0.57	0.413264	0.493358	126
<i>Echium plantagineum</i>	Paterson's Curse	0.665066	0.57	0.412722	0.493332	127
<i>Cyperus teneristolon</i>	Cyperus	0.732975	0.85	0.205759	0.492182	128
<i>Silybum marianum</i>	Variegated Thistle	0.765111	0.57	0.387726	0.491340	129
<i>Centaurea calcitrapa</i>	Star Thistle	0.408196	0.85	0.303943	0.491192	130
<i>Juncus acutus</i>	Spiny Rush	0.516930	0.57	0.438554	0.490022	131
<i>Carduus nutans</i>	Nodding Thistle	0.390918	0.85	0.302426	0.488269	132
<i>Phytolacca viscosa</i>	Prairie Ground Cherry	0.727781	0.71	0.309365	0.487778	133
<i>Ambrosia confertiflora</i>	Burr ragweed	0.594088	0.85	0.226697	0.487241	134
<i>Genista linifolia</i>	Flax Leaved Broom	0.703726	0.57	0.392163	0.486458	135
<i>Nassella hyalina</i>	cane needle grass	0.503576	0.85	0.267807	0.482401	136

Noxious Weeds Review
North East CMA
Phase 3a Species: Ranked relative to Phase 1 & 2 (highlighted in red)

Scientific name	Common name	Invasiveness Score	Regional Dist	Impact Scores	Final Score	RANK
<i>Ibicella lutea</i>	Devil's Claw (yellowflower)	0.616016	0.85	0.241384	0.481097	137
<i>Asparagus asparagoides</i>	bridal creeper	0.782848	0.57	0.361907	0.479010	138
<i>Emex australis</i>	Spiny Emex	0.535113	0.85	0.247396	0.474755	139
<i>Cirsium acarna</i>	Soldier Thistle	0.523968	0.85	0.249563	0.474632	140
<i>Acacia catechu</i>	Cutch tree	0.606058	1.00	0.107969	0.473190	141
<i>Tipuana tipu</i>	Rosewood, tipuana tree	0.454073	1.00	0.140342	0.473080	142
<i>Proboscidea louisianica</i>	Devil's Claw (purpleflower)	0.542172	0.85	0.241384	0.472236	143
<i>Hypericum androsaemum</i>	Tutsan	0.746650	0.71	0.276452	0.471611	144
<i>Solanum rostratum</i>	Buffalo Burr	0.468698	0.85	0.254399	0.470707	145
<i>Carthamus lanatus</i>	Saffron Thistle	0.499430	0.57	0.405518	0.469422	146
<i>Salix x pendulina</i>	Willows	0.586438	0.71	0.276310	0.466506	147
<i>Hypericum humifusum</i>	Trailing St John's wort	0.455230	0.85	0.208817	0.460565	148
<i>Carduus tenuiflorus</i> / <i>C. pycnocephalus</i>	Slender/Shore Thistle	0.608219	0.57	0.359060	0.456460	149
<i>Trianoptiles solitaria</i>	Subterranean Cape sedge	0.510665	0.85	0.188664	0.455932	150
<i>Pittosporum undulatum</i>	sweet pittosporum	0.793704	0.57	0.315117	0.454110	151
<i>Genista monspessulana</i>	Cape Broom /Montpellier Broom	0.698418	0.42	0.419839	0.453320	152
<i>Xanthium strumarium</i>	Bathurst Burr	0.585163	0.57	0.356250	0.452120	153
<i>Hedera helix</i>	English ivy	0.745474	0.42	0.387495	0.449254	154
<i>Hypericum perforatum</i>	St. John's Wort	0.660601	0.57	0.334271	0.448864	155
<i>Leucanthemum vulgare</i>	Ox-eye Daisy	0.610238	0.57	0.333108	0.442169	156
<i>Ambrosia tenuifolia</i>	Lacy ragweed	0.604084	0.85	0.141134	0.440525	157
<i>Chrysanthemoides monilifera</i>	Boneseed/Bitou Bush	0.799614	0.42	0.375091	0.440405	158
<i>Nassella leucotricha</i>	Texas needle grass	0.627929	0.57	0.326146	0.440393	159
<i>Dittrichia graveolens</i>	Stinkwort	0.607585	0.57	0.319717	0.434352	160
<i>Senecio jacobaea</i>	Ragwort	0.776347	0.42	0.363784	0.431281	161
<i>Vinca major</i>	blue periwinkle	0.703021	0.57	0.289181	0.428704	162
<i>Calystegia silvatica</i>	Greater bindweed	0.317991	0.71	0.259324	0.424780	163
<i>Tamarix aphylla</i>	Athel pine, tamarisk	0.673811	0.42	0.355786	0.422897	164
<i>Dipsacus fullonum</i>	Wild Teasel	0.551563	0.57	0.309552	0.421937	165
<i>Allium vineale</i>	Wild Garlic	0.658241	0.57	0.285822	0.421449	166
<i>Melianthus comosus</i>	Tufted Honeyflower	0.492463	0.42	0.394016	0.414144	167
<i>Solanum linnaeanum</i>	Apple of Sodom	0.356227	0.57	0.325025	0.407161	168
<i>Verbascum thapsus</i>	Great Mullein	0.474171	0.57	0.296038	0.405082	169
<i>Watsonia meriana</i> 'Bulbillifera'	Wild Watsonia	0.402004	0.57	0.307647	0.402923	170
<i>Foeniculum vulgare</i>	Fennel	0.574220	0.42	0.326980	0.386415	171
<i>Oxalis pes-caprae</i>	Soursob	0.743995	0.28	0.365451	0.383532	172
<i>Asphodelus fistulosus</i>	Onion Weed	0.539790	0.42	0.328848	0.383330	173
<i>Diplotaxis tenuifolia</i>	Sand Rocket/Sand Mustard	0.565974	0.42	0.317803	0.380286	174
<i>Cirsium vulgare</i>	Spear Thistle	0.693549	0.28	0.353660	0.370875	175
<i>Reseda luteola</i>	Wild Mignonette	0.537021	0.57	0.167145	0.340444	176

* includes *S. x chrysocoma*



Noxious Weeds Review; Phase 3a species
North East CMA
Present distribution and calculation of potential distribution

Common name	Scientific name	IPMS		FIS	Regional Estimate		Weight	Estimate based on: regional description, present potential ratio or gut feeling
		# infestations	area of infestation (ha)	# infestations	# infestations	area of infestation		
Cutch tree	<i>Acacia catechu</i>	0	0	0		0.100	1.00	PIRVic estimate
Prickly acacia	<i>Acacia nilotica</i>	0	0	0		0.100	1.00	PIRVic estimate
Annual ragweed	<i>Ambrosia artemisiifolia</i>	0	0	0		1.000	0.85	PIRVic estimate
Burr ragweed	<i>Ambrosia confertiflora</i>	0	0	0		1.000	0.85	PIRVic estimate
Lacy ragweed	<i>Ambrosia tenuifolia</i>	0	0	0		1.000	0.85	PIRVic estimate
Pond apple	<i>Annona glabra</i>	0	0	0		0.100	1.00	PIRVic estimate
Madeira vine	<i>Anredera cordifolia</i>	0	0	1		1.000	1.00	PIRVic estimate
Chinese violet	<i>Asystasia gangetica ssp. Micrantha</i>	0	0	0		0.100	1.00	PIRVic estimate
Barleria, porcupine flower	<i>Barleria prionitis</i>	0	0	0		0.100	1.00	PIRVic estimate
Kochia	<i>Bassia scoparia</i>	0	0	0		0.100	1.00	PIRVic estimate
Cabomba	<i>Cabomba caroliniana</i>	0	0	0		0.100	0.85	PIRVic estimate
Heather	<i>Calluna vulgaris</i>	0	0	0		0.100	1.00	PIRVic estimate
Greater bindweed	<i>Calystegia silvatica</i>	0	0	0	10	8.000	0.71	
Glaucous star thistle	<i>Carthamus glaucus</i>	0	0	0		1.000	0.85	PIRVic estimate
Spotted knapweed	<i>Centaurea maculosa</i>	0	0	0		1.000	0.85	PIRVic estimate
Siam weed, chromolaena	<i>Chromolaena odorata</i>	0	0	0		0.100	1.00	PIRVic estimate
Rubber vine	<i>Cryptostegia grandiflora</i>	0	0	0		0.100	1.00	PIRVic estimate
Blue hound's tongue	<i>Cynoglossum creticum</i>	0	0	0		0.100	1.00	PIRVic estimate
Cyperus	<i>Cyperus teneristolon</i>	0	0	0		0.100	0.85	PIRVic estimate
African weed-orchid	<i>Disa bracteata</i>	0	0	0		1.000	1.00	PIRVic estimate
False yellowhead	<i>Dittrichia viscosa</i>	0	0	0		0.100	1.00	PIRVic estimate
Senegal tea plant	<i>Gymnocoronis spilanthoides</i>	0	0	0		0.100	0.85	PIRVic estimate
English ivy	<i>Hedera helix</i>	0	0	8	20	5.000	0.42	
Hymenachne, Olive hymenachne	<i>Hymenachne amplexicaulis</i>	0	0	0		0.100	1.00	
Large flowered St John's wort	<i>Hypericum calycinum</i>	0	0	0		1.000	0.85	PIRVic estimate
Canary Island St John's wort	<i>Hypericum canariense</i>	0	0	0		1.000	0.85	PIRVic estimate
Trailing St John's wort	<i>Hypericum humifusum</i>	0	0	0		1.000	0.85	PIRVic estimate
Chinese rain tree	<i>Koelreuteria elegans ssp. formosana</i>	0	0	0		0.100	1.00	PIRVic estimate
Yellow Soldier	<i>Lachenalia reflexa</i>	0	0	0		0.100	1.00	PIRVic estimate
Lantana	<i>Lantana camara</i>	0	0	0	???	100.000	0.42	there are lots of garden plantings of lantana but we're not sure if this is the same species
Miconia	<i>Miconia spp.</i>	0	0	0		1.000	1.00	PIRVic estimate
Mimosa, giant sensitive plant	<i>Mimosa pigra</i>	0	0	0		0.100	1.00	PIRVic estimate
Thistle	<i>Onopordum dissectum</i>	0	0	0		0.000	1.00	PIRVic estimate
Cotton thistle	<i>Onopordum nervosum</i>	0	0	0		1.000	0.85	PIRVic estimate
Taurian thistle	<i>Onopordum tauricum</i>	0	0	0		1.000	0.85	PIRVic estimate
Tiger pear	<i>Opuntia aurantiaca</i>	0	0	0	1	0.100	1.00	
Parkinsonia	<i>Parkinsonia aculeata</i>	0	0	0		0.100	1.00	PIRVic estimate
Garden geranium	<i>Pelargonium alchemilloides</i>	0	0	0		0.100	1.00	PIRVic estimate
Leaf cactus	<i>Pereskia aculeata</i>	0	0	0		0.100	0.85	PIRVic estimate
Uruguayan rice grass	<i>Piptochaetium montevidense</i>	0	0	0		0.100	1.00	PIRVic estimate
Praxelis	<i>Praxelis clematidea</i>	0	0	0		0.100	1.00	PIRVic estimate
White weeping broom	<i>Retama raetam</i>	0	0	0		0.100	1.00	PIRVic estimate
Giant bramble	<i>Rubus alceifolius</i>	0	0	0		1.000	1.00	PIRVic estimate
Florida blackberry	<i>Rubus argutus</i>	0	0	0		1.000	1.00	PIRVic estimate
Keriberry	<i>Rubus rugosus</i>	0	0	0		1.000	0.71	PIRVic estimate
Arrowhead	<i>Sagittaria montevidensis</i>	0	0	0		1.000	0.71	PIRVic estimate
Delta arrowhead	<i>Sagittaria platyphylla</i>	0	0	2		1.000	0.71	PIRVic estimate
Dwarf arrowhead	<i>Sagittaria pygmaea</i>	0	0	0		0.100	1.00	PIRVic estimate
Willows	<i>Salix alba</i>	0	0	14		14.000	0.57	PIRVic estimate (FIS)
Willows	<i>Salix cinerea</i>	0	0	43		43.000	0.57	PIRVic estimate (FIS)
Willows	<i>Salix fragilis</i>	0	0	4		4.000	0.57	PIRVic estimate (FIS)
Willows	<i>Salix humboldtiana</i>	0	0	0		0.100	1.00	PIRVic estimate (FIS)
Willows	<i>Salix matsudana</i>	0	0	0		0.100	0.85	PIRVic estimate (FIS)
Willows	<i>Salix nigra</i>	0	0	4		4.000	0.57	PIRVic estimate (FIS)
Willows	<i>Salix purpurea</i>	0	0	3		3.000	0.57	PIRVic estimate (FIS)
Willows	<i>Salix viminalis</i>	0	0	0		0.100	0.85	PIRVic estimate (FIS)
Willows	<i>Salix x pendulina</i>	0	0	0		0.100	0.71	PIRVic estimate (FIS)
Willows	<i>Salix x rubens</i>	0	0	7		7.000	0.57	PIRVic estimate (FIS)
Willows	<i>Salix x sepulcralis</i> ¹	0	0	0		0.100	0.85	PIRVic estimate (FIS)
Spotted thistle	<i>Scolymus maculatus</i>	0	0	0		1.000	0.85	PIRVic estimate
Holly leaved senecio	<i>Senecio glastifolius</i>	0	0	0		0.100	1.00	PIRVic estimate
Athel pine, tamarisk	<i>Tamarix aphylla</i>	0	0	0		1.000	0.42	numerous urban plantings
Laurel clock vine	<i>Thunbergia laurifolia</i>	0	0	0		0.100	1.00	PIRVic estimate
Rosewood, tipuana tree	<i>Tipuana tipu</i>	0	0	0		0.100	1.00	PIRVic estimate
Subterranean Cape sedge	<i>Trianoptiles solitaria</i>	0	0	0		1.000	0.85	PIRVic estimate

¹ includes *S. x chrysocoma*

Noxious Weeds Review; Phase 3a species
North East CMA
Potential distribution by landuse and public land

Common name	Scientific name	Potential area* infested by landuse type						Potential total area
		Horticulture	Broadacre cropping	Forestry	Pasture dryland	Pasture irrigated	Public land	
Cutch tree	<i>Acacia catechu</i>	0	0	0	0	0	0	0
Prickly acacia	<i>Acacia nilotica</i>	0	0	0	425,800	1,300	350,500	777,600
Annual ragweed	<i>Ambrosia artemisiifolia</i>	7,392	91,358	0	552,050	1,348	2,278	654,426
Burr ragweed	<i>Ambrosia confertiflora</i>	0	91,228	0	375,006	1,337	2,073	469,644
Lacy ragweed	<i>Ambrosia tenuifolia</i>	0	0	0	552,050	0	2,278	554,328
Pond apple	<i>Annona glabra</i>	0	0	0	0	0	0	0
Madeira vine	<i>Anredera cordifolia</i>	0	0	50,800	0	0	1,249,900	1,300,700
Chinese violet	<i>Asystasia gangetica ssp. micrantha</i>	7,392	91,300	50,800	0	0	0	149,492
Barleria, porcupine flower	<i>Barleria prionitis</i>	0	0	0	0	0	0	0
Kochia	<i>Bassia scoparia</i>	0	91,358	0	545,600	0	2,300	639,258
Cabomba	<i>Cabomba caroliniana</i>	0	0	0	0	0	49,100	49,100
Heather	<i>Calluna vulgaris</i>	0	0	50,700	428,200	0	78,800	557,700
Greater bindweed	<i>Calystegia silvatica</i>	7,392	0	0	552,050	0	0	559,442
Glaucous star thistle	<i>Carthamus glaucus</i>	0	87,987	0	155,064	0	0	243,051
Spotted knapweed	<i>Centaurea maculosa</i>	0	0	0	432,100	1,300	40,200	473,600
Siam weed, chromolaena	<i>Chromolaena odorata</i>	0	0	0	0	0	0	0
Rubber vine	<i>Cryptostegia grandiflora</i>	0	0	0	0	0	0	0
Blue hound's tongue	<i>Cynoglossum creticum</i>	7,000	0	0	374,800	0	253,100	634,900
Cyperus	<i>Cyperus teneristolon</i>	2,300	87,763	0	0	342	800	91,205
African weed-orchid	<i>Disa bracteata</i>	0	0	0	545,634	1,348	885,716	1,432,698
False yellowhead	<i>Dittrichia viscosa</i>	0	0	0	552,050	1,348	59,478	612,876
Senegal tea plant	<i>Gymnocoronis spilanthoides</i>	0	0	0	0	1,300	58,700	60,000
English ivy	<i>Hedera helix</i>	0	0	50,852	0	0	1,069,121	1,119,973
Hymenachne, Olive hymenachne	<i>Hymenachne amplexicaulis</i>	0	0	0	0	0	0	0
Large flowered St John's wort	<i>Hypericum calycinum</i>	0	0	0	552,050	1,348	45,226	598,624
Canary Island St John's wort	<i>Hypericum canariense</i>	0	0	0	432,111	1,337	2,278	435,726
Trailing St John's wort	<i>Hypericum humifusum</i>	0	91,358	0	552,050	1,348	34,300	679,056
Chinese rain tree	<i>Koelreuteria elegans ssp. formosana</i>	0	0	0	0	0	0	0
Yellow Soldier	<i>Lachenalia reflexa</i>	0	0	0	0	0	0	0
Lantana	<i>Lantana camara</i>	0	0	50,800	552,050	1,400	253,700	857,950
Miconia	<i>Miconia spp.</i>	0	0	0	0	0	0	0
Mimosa, giant sensitive plant	<i>Mimosa pigra</i>	0	0	0	0	0	0	0
Thistle	<i>Onopordum dissectum</i>							N/A
Cotton thistle	<i>Onopordum nervosum</i>	7,392	0	0	538,153	0	36,578	582,123
Taurian thistle	<i>Onopordum tauricum</i>	0	0	0	531,854	1,337	49,557	582,748
Tiger pear	<i>Opuntia aurantiaca</i>	0	0	0	552,050	0	45,226	597,276
Parkinsonia	<i>Parkinsonia aculeata</i>	0	0	0	538,200	0	729,300	1,267,500
Garden geranium	<i>Pelargonium alchemilloides</i>	0	0	0	518,028	1,337	422,360	941,725
Leaf cactus	<i>Pereskia aculeata</i>	0	0	0	0	0	70,700	70,700
Uruguayan rice grass	<i>Piptochaetium montevidense</i>	0	91,200	0	432,100	0	40,200	563,500
Praxelis	<i>Praxelis clematidea</i>	0	0	0	0	0	0	0
White weeping broom	<i>Retama raetam</i>	0	0	0	482,103	0	127,362	609,465
Giant bramble	<i>Rubus alceifolius</i>	0	0	0	0	0	0	0
Florida blackberry	<i>Rubus argutus</i>	0	0	50,800	0	0	1,183,900	1,234,700
Keriberry	<i>Rubus rugosus</i>	0	0	0	0	0	94,564	94,564
Arrowhead	<i>Sagittaria montevidensis</i>	0	0	0	0	1,400	57,700	59,100
Delta arrowhead	<i>Sagittaria platyphylla</i>	0	0	0	0	1,300	57,700	59,000
Dwarf arrowhead	<i>Sagittaria pygmaea</i>							0
Willows	<i>Salix alba</i>	0	0	0	0	0	11,477	11,477
Willows	<i>Salix cinerea</i>	0	0	0	0	0	37,163	37,163
Willows	<i>Salix fragilis</i>	0	0	0	0	0	11,477	11,477
Willows	<i>Salix humboldtiana</i>	0	0	0	0	0	0	0
Willows	<i>Salix matsudana</i>	0	0	0	0	0	11,477	11,477
Willows	<i>Salix nigra</i>	0	0	0	0	0	11,477	11,477
Willows	<i>Salix purpurea</i>	0	0	0	0	0	11,477	11,477
Willows	<i>Salix viminalis</i>	0	0	0	0	0	11,477	11,477
Willows	<i>Salix x pendulina</i>	0	0	0	0	0	7,119	7,119
Willows	<i>Salix x rubens</i>	0	0	0	0	0	11,477	11,477
Willows	<i>Salix x sepulcralis</i> ¹	0	0	0	0	0	11,477	11,477
Spotted thistle	<i>Scolymus maculatus</i>	0	87,875	0	85,691	342	13,471	187,379
Holly leaved senecio	<i>Senecio glastifolius</i>	0	0	0	428,143	793	3,033	431,969
Athel pine, tamarisk	<i>Tamarix aphylla</i>	0	0	0	0	0	6,528	6,528
Laurel clock vine	<i>Thunbergia laurifolia</i>		0	0	0	0	0	0
Rosewood, tipuana tree	<i>Tipuana tipu</i>	0	0	0	0	0	0	0
Subterranean Cape sedge	<i>Trianoptiles solitaria</i>	0	0	0	0	1,337	129,121	130,458

*unit of measure is hectare
N/A = Not available (too few data)
¹ includes *S. x chrysocoma*

Noxious Weeds Review; Phase 3a species
Port Phillip CMA
Regional score and rank

Scientific name	Common name	Inv. Score	Regional dist.	Impact Score	Regional score	Regional rank	Rank Relative to Phase 1*
<i>Acacia catechu</i>	Cutch tree	0.6061	1.00	0.1080	0.4732	53	137
<i>Acacia nilotica</i>	Prickly acacia	0.5744	1.00	0.5345	0.7082	3	4
<i>Ambrosia artemisiifolia</i>	Annual ragweed	0.5760	0.85	0.2849	0.5177	40	98
<i>Ambrosia confertiflora</i>	Burr ragweed	0.5941	0.85	0.2267	0.4872	48	126
<i>Ambrosia tenuifolia</i>	Lacy ragweed	0.6041	0.85	0.1411	0.4405	61	155
<i>Annona glabra</i>	Pond apple	0.6948	0.42	0.2587	0.3710	65	174
<i>Anredera cordifolia</i>	Madeira vine	0.7660	0.85	0.3585	0.5817	24	48
<i>Asystasia gangetica ssp. micrantha</i>	Chinese violet	0.5931	0.71	0.2305	0.4417	60	154
<i>Barleria prionitis</i>	Barleria, porcupine flower	0.7002	1.00	0.1502	0.5081	44	107
<i>Bassia scoparia</i>	Kochia	0.6106	0.85	0.3563	0.5618	32	62
<i>Cabomba caroliniana</i>	Cabomba	0.6202	0.71	0.4813	0.5854	23	47
<i>Calluna vulgaris</i>	Heather	0.6742	0.85	0.2891	0.5318	37	88
<i>Calystegia silvatica</i>	Greater bindweed	0.3180	0.85	0.2593	0.4724	55	139
<i>Carthamus glaucus</i>	Glaucous star thistle	0.5168	0.71	0.3251	0.4855	49	128
<i>Centaurea maculosa</i>	Spotted knapweed	0.7544	0.85	0.5016	0.6604	11	21
<i>Chromolaena odorata</i>	Siam weed, chromolaena	0.7892	1.00	0.4469	0.6850	7	16
<i>Cryptostegia grandiflora</i>	Rubber vine	0.7574	1.00	0.4880	0.7042	4	5
<i>Cynoglossum creticum</i>	Blue hound's tongue	0.5987	0.85	0.2110	0.4790	50	132
<i>Cyperus teneristolon</i>	Cyperus	0.7330	0.57	0.2058	0.3970	64	169
<i>Disa bracteata</i>	African weed-orchid	0.7635	0.71	0.2567	0.4768	51	133
<i>Dittrichia viscosa</i>	False yellowhead	0.6756	0.85	0.2327	0.5004	46	113
<i>Gymnocoronis spilanthoides</i>	Senegal tea plant	0.4856	0.71	0.3575	0.4999	47	114
<i>Hedera helix</i>	English ivy	0.7455	0.42	0.3875	0.4493	58	150
<i>Hymenachne amplexicaulis</i>	Hymenachne, Olive hymenachne	0.6675	0.85	0.6456	0.7306	2	2
<i>Hypericum calycinum</i>	Large flowered St John's wort	0.5533	0.85	0.3388	0.5451	35	78
<i>Hypericum canariense</i>	Canary Island St John's wort	0.5055	0.85	0.2873	0.5106	42	103
<i>Hypericum humifusum</i>	Trailing St John's wort	0.4552	0.85	0.2088	0.4606	56	144
<i>Koeleruteria elegans ssp.formosana</i>	Chinese rain tree	0.5911	1.00	0.1677	0.5048	45	109
<i>Lachenalia reflexa</i>	Yellow Soldier	0.4270	1.00	0.3116	0.5657	31	58
<i>Lantana camara</i>	Lantana	0.6496	0.42	0.6372	0.5776	27	51
<i>Miconia spp.</i>	Miconia	0.8664	1.00	0.3037	0.6140	17	35
<i>Mimosa pigra</i>	Mimosa, giant sensitive plant	0.8180	1.00	0.3506	0.6345	13	29
<i>Onopordum dissectum</i>	Thistle	0.4312	1.00	0.3832	0.6063	20	39
<i>Onopordum nervosum</i>	Cotton thistle	0.5962	0.85	0.4685	0.6229	15	33
<i>Onopordum tauricum</i>	Taurian thistle	0.4682	0.85	0.3464	0.5392	36	82
<i>Opuntia aurantiaca</i>	Tiger pear	0.6516	0.71	0.6580	0.6881	6	14
<i>Parkinsonia aculeata</i>	Parkinsonia	0.6416	0.85	0.5568	0.6778	8	17
<i>Pelargonium alchemilloides</i>	Garden geranium	0.6058	0.85	0.3686	0.5681	29	56
<i>Pereskia aculeata</i>	Leaf cactus	0.7889	0.85	0.7331	0.7942	1	1
<i>Piptochaetium montevidense</i>	Uruguayan rice grass	0.7066	0.85	0.3544	0.5723	28	53
<i>Praxelis clematidea</i>	Praxelis	0.7051	1.00	0.3349	0.6121	18	36
<i>Retama raetam</i>	White weeping broom	0.6883	0.85	0.5053	0.6546	12	22
<i>Rubus alceifolius</i>	Giant bramble	0.6207	1.00	0.1977	0.5252	39	95
<i>Rubus argutus</i>	Florida blackberry	0.8084	0.71	0.4430	0.5865	21	45
<i>Rubus rugosus</i>	Keriberry	0.6752	0.85	0.4284	0.6100	19	37
<i>Sagittaria montevidensis</i>	Arrowhead	0.6835	0.71	0.4546	0.5780	25	49
<i>Sagittaria platyphylla</i>	Delta arrowhead	0.6835	0.71	0.4546	0.5780	25	49
<i>Sagittaria pygmaea</i>	Dwarf arrowhead	0.6835	1.00	0.4546	0.6766	10	19
<i>Salix alba</i>	Willows	0.5995	0.42	0.5951	0.5480	34	77
<i>Salix cinerea</i>	Willows	0.9190	0.57	0.6668	0.6775	9	18
<i>Salix fragilis</i>	Willows	0.5141	0.42	0.6283	0.5563	33	68
<i>Salix humboltiana</i>	Willows	0.5007	0.57	0.3397	0.4441	59	152
<i>Salix matsudana</i>	Willows	0.5980	0.71	0.3534	0.5110	41	102
<i>Salix nigra</i>	Willows	0.5656	0.71	0.5594	0.6225	16	34
<i>Salix purpurea</i>	Willows	0.7995	0.71	0.6302	0.6902	5	12
<i>Salix viminalis</i>	Willows	0.5605	0.71	0.4960	0.5864	22	46
<i>Salix x pendulina</i>	Willows	0.5864	0.57	0.2763	0.4189	62	163
<i>Salix x rubens</i>	Willows	0.6057	0.42	0.6283	0.5673	30	57
<i>Salix x sepulcralis</i>	Willows	0.5920	0.71	0.3534	0.5103	43	104

Noxious Weeds Review; Phase 3a species
Port Phillip CMA
Regional score and rank

Scientific name	Common name	Inv. Score	Regional dist.	Impact Score	Regional score	Regional rank	Rank Relative to Phase 1*
<i>Scolymus maculatus</i>	Spotted thistle	0.7940	0.71	0.2136	0.4563	57	146
<i>Senecio glastifolius</i>	Holly leaved senecio	0.5973	0.85	0.3018	0.5297	38	91
<i>Tamarix aphylla</i>	Athel pine, tamarisk	0.6738	0.57	0.3558	0.4739	52	136
<i>Thunbergia laurifolia</i>	Laurel clock vine	0.4405	1.00	0.4150	0.6253	14	32
<i>Tipuana tipu</i>	Rosewood, tipuana tree	0.4541	1.00	0.1403	0.4731	54	138
<i>Trianoptiles solitaria</i>	Subterranean Cape sedge	0.5107	0.71	0.1887	0.4083	63	165

* includes *S. x chrysocoma*



Noxious Weeds Review
Port Phillip CMA
Phase 3a Species: Ranked relative to Phase 1 & 2 (highlighted in red)

Scientific name	Common name	Invasiveness Score	Regional Dist	Impact Scores	Final Score	RANK
<i>Pereskia aculeata</i>	Leaf cactus	0.788886	0.85	0.733119	0.794213	1
<i>Hymenachne amplexicaulis</i>	Hymenachne, Olive hymenachne	0.667534	0.85	0.645600	0.730640	2
<i>Eichhornia crassipes</i>	Water Hyacinth	0.879335	1	0.527622	0.720989	3
<i>Acacia nilotica</i>	Prickly acacia	0.574417	1.00	0.534471	0.708234	4
<i>Cryptostegia grandiflora</i>	Rubber vine	0.757375	1.00	0.488003	0.704167	5
<i>Orobancha ramosa</i>	Branched Broomrape	0.769900	1	0.519638	0.703385	6
<i>Pennisetum macrourum</i>	African Feather Grass	0.612026	0.85	0.627185	0.696667	7
<i>Acacia erioloba</i>	Giraffe thorn	0.700000	1	0.519638	0.694997	8
<i>Hieracium spp.</i>	Hawkweeds	0.700000	1	0.519638	0.694997	8
<i>Nassella tenuissima</i>	Mexican feather grass	0.700000	1	0.519638	0.694997	8
<i>Acacia karroo</i>	Karoo thorn	0.670000	1	0.519638	0.691397	11
<i>Salix purpurea</i>	Willows	0.799511	0.71	0.630180	0.690242	12
<i>Nassella charruana</i>	Lobed needle grass	0.650000	1	0.519638	0.688997	13
<i>Opuntia aurantiaca</i>	Tiger pear	0.651556	0.71	0.657976	0.688053	14
<i>Salvinia molesta</i>	Salvinia	0.587464	1	0.529090	0.686786	15
<i>Chromolaena odorata</i>	Siam weed, chromolaena	0.789234	1.00	0.446929	0.684988	16
<i>Parkinsonia aculeata</i>	Parkinsonia	0.641562	0.85	0.556809	0.677801	17
<i>Salix cinerea</i>	Willows	0.919002	0.57	0.666778	0.677476	18
<i>Sagittaria pygmaea</i>	Dwarf arrowhead	0.683469	1.00	0.454599	0.676592	19
<i>Fallopia japonica, Fallopia sachalinensis</i>	Japanese and Giant knotweed	0.506400	1	0.519638	0.671765	20
<i>Centaurea maculosa .</i>	Spotted knapweed	0.754357	0.85	0.501646	0.660445	21
<i>Retama raetam</i>	White weeping broom	0.688328	0.85	0.505316	0.654576	22
<i>Parthenium hysterophorus</i>	Parthenium Weed	0.825166	1	0.420087	0.654269	23
<i>Nassella trichotoma</i>	Serrated Tussock	0.761536	0.57	0.675277	0.651939	24
<i>Equisetum spp.</i>	Horsetails	0.726000	0.85	0.519638	0.650117	25
<i>Alternanthera philoxeroides</i>	Alligator Weed	0.527352	0.57	0.719621	0.648670	26
<i>Prosopis spp.</i>	Mesquite	0.658431	0.85	0.521093	0.642824	27
<i>Iva axillaris</i>	Poverty Weed	0.538501	1	0.453036	0.638320	28
<i>Mimosa pigra</i>	Mimosa, giant sensitive plant	0.818008	1.00	0.350578	0.634484	29
<i>Rubus fruticosus agg.</i>	Blackberry	0.767146	0.42	0.726464	0.633277	30
<i>Xanthium spinosum</i>	Noogoora Burr/ Californian Burr	0.619536	0.85	0.500315	0.626521	31
<i>Thunbergia laurifolia</i>	Laurel clock vine	0.440524	1.00	0.415005	0.625266	32
<i>Onopordum nervosum</i>	Cotton thistle	0.596175	0.85	0.468505	0.622904	33
<i>Salix nigra</i>	Willows	0.565578	0.71	0.559364	0.622513	34
<i>Miconia spp.</i>	Miconia	0.866385	1.00	0.303706	0.614041	35
<i>Praxelis clematidea</i>	Praxelis	0.705095	1.00	0.334863	0.612135	36
<i>Rubus rugosus</i>	Keriberry	0.675226	0.85	0.428443	0.609955	37
<i>Convolvulus arvensis</i>	Bindweed	0.779101	0.85	0.430366	0.606497	38
<i>Onopordum dissectum</i>	Thistle	0.431190	1.00	0.383170	0.606318	39
<i>Echium vulgare</i>	Viper's Bugloss	0.655865	0.85	0.446556	0.600775	40
<i>Lagarosiphon major</i>	Lagarosiphon	0.649037	1	0.342517	0.589694	41
<i>Homeria flaccida</i>	Cape Tulip (two-leaf)	0.684162	0.85	0.417379	0.587832	42
<i>Centaurea solstitialis</i>	St. Barnaby's Thistle	0.655091	0.85	0.423400	0.587715	43
<i>Ulex europaeus</i>	Furze/Gorse	0.828248	0.57	0.545087	0.587038	44
<i>Rubus argutus</i>	Florida blackberry	0.808417	0.71	0.442982	0.586480	45
<i>Salix viminalis</i>	Willows	0.560486	0.71	0.495981	0.586408	46
<i>Cabomba caroliniana</i>	Cabomba	0.620155	0.71	0.481313	0.585354	47
<i>Anredera cordifolia</i>	Madeira vine	0.766046	0.85	0.358456	0.581661	48
<i>Sagittaria montevidensis</i>	Arrowhead	0.683469	0.71	0.454599	0.577992	49
<i>Sagittaria platyphylla</i>	Delta arrowhead	0.683469	0.71	0.454599	0.577992	49
<i>Lantana camara</i>	Lantana	0.649647	0.42	0.637247	0.577616	51
<i>Acroptilon repens</i>	Hardheads/Russian Knapweed	0.514006	0.85	0.434553	0.577030	52
<i>Piptochaetium montevidense</i>	Uruguayan rice grass	0.706617	0.85	0.354400	0.572258	53
<i>Nassella neesiana</i>	Chilean needle grass	0.686622	0.57	0.543816	0.569332	54
<i>Cirsium arvense</i>	Californian/Perennial Thistle	0.702729	0.71	0.458673	0.568385	55
<i>Pelargonium alchemilloides</i>	Garden geranium	0.605828	0.85	0.368643	0.568139	56
<i>Salix x rubens</i>	Willows	0.605670	0.42	0.628311	0.567335	57
<i>Lachenalia reflexa</i>	Yellow Soldier	0.426976	1.00	0.311622	0.565746	58
<i>Homeria miniata</i>	Cape Tulip (one-leaf)	0.747658	0.71	0.440860	0.563800	59
<i>Rosa rubiginosa</i>	Sweet Briar	0.793721	0.57	0.508953	0.562660	60
<i>Cytisus scoparius</i>	English Broom	0.734874	0.57	0.520938	0.562310	61
<i>Bassia scoparia</i>	Kochia	0.610614	0.85	0.356267	0.561783	62
<i>Onopordum illyricum</i>	Illyrian Thistle	0.533147	0.85	0.401999	0.561097	63
<i>Datura ferox</i>	Thorn Apple (common)	0.703633	0.71	0.444751	0.560697	64
<i>Datura stramonium</i>	Thorn Apple (longspine)	0.703600	0.71	0.444751	0.560693	65
<i>Datura inoxia</i>	Thorn Apple (recurved)	0.703600	0.71	0.444751	0.560693	65
<i>Alhagi maurorum</i>	Camelthorn	0.569959	0.85	0.386286	0.556715	67
<i>Salix fragilis</i>	Willows	0.514090	0.42	0.628311	0.556345	68

Noxious Weeds Review
Port Phillip CMA
Phase 3a Species: Ranked relative to Phase 1 & 2 (highlighted in red)

Scientific name	Common name	Invasiveness Score	Regional Dist	Impact Scores	Final Score	RANK
<i>Cuscuta</i> spp.	Dodder	0.734033	0.71	0.429397	0.555746	69
<i>Hypericum triquetrifolium</i>	Tangled Hypericum	0.602251	0.85	0.377231	0.555520	70
<i>Cannabis sativa</i>	Marijuana	0.565385	1	0.297461	0.554424	71
<i>Onopordum acanthium</i>	Scotch/Heraldic Thistle	0.571238	0.85	0.381627	0.554260	72
<i>Allium triquetrum</i>	Angled Onion	0.614461	0.71	0.448094	0.551868	73
<i>Tribulus terrestris</i>	Caltrop	0.606654	0.85	0.368584	0.551205	74
<i>Festuca gautieri</i>	bearskin fescue	0.491440	0.85	0.387816	0.548150	75
<i>Amsinckia</i> spp.	Amsinckia	0.745464	0.85	0.333240	0.548070	76
<i>Salix alba</i>	Willows	0.599482	0.42	0.595056	0.547969	77
<i>Hypericum calycinum</i>	Large flowered St John's wort	0.553290	0.85	0.338782	0.545113	78
<i>Salpichroa origanifolia</i>	Pampas Lily-of-the-Valley	0.762638	0.85	0.320066	0.542753	79
<i>Opuntia robusta</i>	Wheel Cactus	0.645158	0.85	0.345016	0.542628	80
<i>Senecio pterophorus</i>	African Daisy	0.676556	0.85	0.337358	0.542107	81
<i>Onopordum tauricum</i>	Taurian thistle	0.468246	0.85	0.346370	0.539157	82
<i>Chondrilla juncea</i>	Skeleton Weed	0.742382	0.85	0.315662	0.537856	83
<i>Ailanthus altissima</i>	Tree of Heaven	0.895314	0.57	0.441183	0.536900	84
<i>Cardaria draba</i>	Hoary Cress	0.563497	0.71	0.429138	0.535137	85
<i>Ambrosia psilostachya</i>	Perennial Ragweed	0.489293	0.85	0.364356	0.534755	86
<i>Eragrostis curvula</i>	African Lovegrass	0.715330	0.85	0.314456	0.533935	87
<i>Calluna vulgaris</i>	Heather	0.674172	0.85	0.289081	0.531786	88
<i>Opuntia stricta</i>	Prickly Pear (drooping)	0.552003	0.85	0.345016	0.531449	89
<i>Lavandula stoechas</i>	Topped Lavender	0.682210	0.85	0.316423	0.531062	90
<i>Senecio glastifolius</i>	Holly leaved senecio	0.597307	0.85	0.301771	0.529669	91
<i>Marrubium vulgare</i>	Horehound	0.771737	0.57	0.451853	0.528046	92
<i>Lycium ferocissimum</i>	Boxthorn	0.674957	0.57	0.470710	0.526993	93
<i>Centaurea nigra</i>	Black Knapweed	0.641607	0.85	0.317275	0.526667	94
<i>Rubus alceifolius</i>	Giant bramble	0.620743	1.00	0.197677	0.525188	95
<i>Alternanthera pungens</i>	Khaki Weed	0.653479	0.85	0.303604	0.520436	96
<i>Cytisus multiflorus</i>	white Spanish broom	0.517034	0.85	0.330775	0.519278	97
<i>Ambrosia artemisiifolia</i>	Annual ragweed	0.575985	0.85	0.284903	0.517664	98
<i>Cestrum parqui</i>	Chilean Cestrum	0.727801	0.71	0.358471	0.515280	99
<i>Conium maculatum</i>	Hemlock	0.665290	0.57	0.446703	0.512388	100
<i>Opuntia vulgaris</i>	Prickly Pear (erect)	0.759228	0.71	0.345016	0.511516	101
<i>Salix matsudana</i>	Willows	0.598025	0.71	0.353359	0.511044	102
<i>Hypericum canariense</i>	Canary Island St John's wort	0.505525	0.85	0.287333	0.510570	103
<i>Salix x sepulcralis</i>	Willows	0.592031	0.71	0.353359	0.510325	104
<i>Sagittaria graminea</i>	Arrowhead	0.586551	0.85	0.298489	0.509540	105
<i>Sida leprosa</i>	Ivy-leaved Sida	0.485639	1	0.234041	0.509339	106
<i>Barleria prionitis</i>	Barleria, porcupine flower	0.700199	1.00	0.150169	0.508118	107
<i>Solanum elaeagnifolium</i>	Silverleaf Nightshade	0.667968	0.71	0.357925	0.507794	108
<i>Koeleruteria elegans ssp.formos.</i>	Chinese rain tree	0.591073	1.00	0.167702	0.504842	109
<i>Calicotome spinosa</i>	Spiny Broom	0.447135	0.85	0.317558	0.503489	110
<i>Crataegus monogyna</i>	Hawthorn	0.704590	0.42	0.506902	0.502816	111
<i>Spartium junceum</i>	Spanish broom	0.341815	0.85	0.33587	0.501105	112
<i>Dittrichia viscosa</i>	False yellowhead	0.675616	0.85	0.232653	0.500360	113
<i>Gymnocoronis spilanthoides</i>	Senegal tea plant	0.485586	0.71	0.357542	0.499894	114
<i>Scolymus hispanicus</i>	Golden Thistle	0.497723	0.71	0.377717	0.498448	115
<i>Hypericum tetrapterum</i>	St. Peter's Wort	0.552896	0.85	0.284303	0.497557	116
<i>Cenchrus longispinus</i>	Spiny Burr Grass/ Gentle Annie	0.402417	0.85	0.313125	0.495640	117
<i>Onopordum acaulon</i>	Stemless Thistle	0.528267	0.85	0.285015	0.495001	118
<i>Cynara cardunculus</i>	Artichoke Thistle	0.662745	0.57	0.413264	0.493358	119
<i>Echium plantagineum</i>	Paterson's Curse	0.665066	0.57	0.412722	0.493332	120
<i>Silybum marianum</i>	Variegated Thistle	0.765111	0.57	0.387726	0.491340	121
<i>Centaurea calcitrapa</i>	Star Thistle	0.408196	0.85	0.303943	0.491192	122
<i>Juncus acutus</i>	Spiny Rush	0.516930	0.57	0.438554	0.490022	123
<i>Carduus nutans</i>	Nodding Thistle	0.390918	0.85	0.302426	0.488269	124
<i>Physalis viscosa</i>	Prairie Ground Cherry	0.727781	0.71	0.309365	0.487778	125
<i>Ambrosia confertiflora</i>	Burr ragweed	0.594088	0.85	0.226697	0.487241	126
<i>Genista linifolia</i>	Flax Leaved Broom	0.703726	0.57	0.392163	0.486458	127
<i>Carthamus glaucus</i>	Glaucous star thistle	0.516750	0.71	0.325102	0.485467	128
<i>Nassella hyalina</i>	cane needle grass	0.503576	0.85	0.267807	0.482401	129
<i>Ibicella lutea</i>	Devil's Claw (yellowflower)	0.616016	0.85	0.241384	0.481097	130
<i>Asparagus asparagoides</i>	bridal creeper	0.782848	0.57	0.361907	0.479010	131
<i>Cynoglossum creticum</i>	Blue hound's tongue	0.598661	0.85	0.210974	0.478985	132
<i>Disa bracteata</i>	African weed-orchid	0.763497	0.71	0.256714	0.476779	133
<i>Emex australis</i>	Spiny Emex	0.535113	0.85	0.247396	0.474755	134
<i>Cirsium acarna</i>	Soldier Thistle	0.523968	0.85	0.249563	0.474632	135
<i>Tamarix aphylla</i>	Athel pine, tamarisk	0.673811	0.57	0.355786	0.473897	136

Noxious Weeds Review
Port Phillip CMA
Phase 3a Species: Ranked relative to Phase 1 & 2 (highlighted in red)

Scientific name	Common name	Invasiveness Score	Regional Dist	Impact Scores	Final Score	RANK
<i>Acacia catechu</i>	Cutch tree	0.606058	1.00	0.107969	0.473190	137
<i>Tipuana tipu</i>	Rosewood, tipuana tree	0.454073	1.00	0.140342	0.473080	138
<i>Calystegia silvatica</i>	Greater bindweed	0.317991	0.85	0.259324	0.472380	139
<i>Proboscidea louisianica</i>	Devil's Claw (purpleflower)	0.542172	0.85	0.241384	0.472236	140
<i>Hypericum androsaemum</i>	Tutsan	0.746650	0.71	0.276452	0.471611	141
<i>Solanum rostratum</i>	Buffalo Burr	0.468698	0.85	0.254399	0.470707	142
<i>Carthamus lanatus</i>	Saffron Thistle	0.499430	0.57	0.405518	0.469422	143
<i>Hypericum humifusum</i>	Trailing St John's wort	0.455230	0.85	0.208817	0.460565	144
<i>Carduus tenuiflorus</i> / <i>C. pycnocephalus</i>	Slender/Shore Thistle	0.608219	0.57	0.359060	0.456460	145
<i>Scolymus maculatus</i>	Spotted thistle	0.794014	0.71	0.213592	0.456293	146
<i>Pittosporum undulatum</i>	sweet pittosporum	0.793704	0.57	0.315117	0.454110	147
<i>Genista monspessulana</i>	Cape Broom /Montpellier Broom	0.698418	0.42	0.419839	0.453320	148
<i>Xanthium strumarium</i>	Bathurst Burr	0.585163	0.57	0.356250	0.452120	149
<i>Hedera helix</i>	English ivy	0.745474	0.42	0.387495	0.449254	150
<i>Hypericum perforatum</i>	St. John's Wort	0.660601	0.57	0.334271	0.448864	151
<i>Salix humboldtiana</i>	Willows	0.500663	0.57	0.339666	0.444093	152
<i>Leucanthemum vulgare</i>	Ox-eye Daisy	0.610238	0.57	0.333108	0.442169	153
<i>Asystasia gangetica</i> ssp. <i>micrantha</i>	Chinese violet	0.593129	0.71	0.230522	0.441668	154
<i>Ambrosia tenuifolia</i>	Lacy ragweed	0.604084	0.85	0.141134	0.440525	155
<i>Chrysanthemoides monilifera</i>	Boneseed/Bitou Bush	0.799614	0.42	0.375091	0.440405	156
<i>Nassella leucotricha</i>	Texas needle grass	0.627929	0.57	0.326146	0.440393	157
<i>Dittrichia graveolens</i>	Stinkwort	0.607585	0.57	0.319717	0.434352	158
<i>Senecio jacobaea</i>	Ragwort	0.776347	0.42	0.363784	0.431281	159
<i>Vinca major</i>	blue periwinkle	0.703021	0.57	0.289181	0.428704	160
<i>Dipsacus fullonum</i>	Wild Teasel	0.551563	0.57	0.309552	0.421937	161
<i>Allium vineale</i>	Wild Garlic	0.658241	0.57	0.285822	0.421449	162
<i>Salix x pendulina</i>	Willows	0.586438	0.57	0.276310	0.418906	163
<i>Melianthus comosus</i>	Tufted Honeyflower	0.492463	0.42	0.394016	0.414144	164
<i>Trianoptiles solitaria</i>	Subterranean Cape sedge	0.510665	0.71	0.188664	0.408332	165
<i>Solanum linnaeanum</i>	Apple of Sodom	0.356227	0.57	0.325025	0.407161	166
<i>Verbascum thapsus</i>	Great Mullein	0.474171	0.57	0.296038	0.405082	167
<i>Watsonia meriana</i> 'Bulbillifera'	Wild Watsonia	0.402004	0.57	0.307647	0.402923	168
<i>Cyperus teneristolon</i>	Cyperus	0.732975	0.57	0.205759	0.396982	169
<i>Foeniculum vulgare</i>	Fennel	0.574220	0.42	0.326980	0.386415	170
<i>Oxalis pes-caprae</i>	Soursob	0.743995	0.28	0.365451	0.383532	171
<i>Asphodelus fistulosus</i>	Onion Weed	0.539790	0.42	0.328848	0.383330	172
<i>Diplotaxis tenuifolia</i>	Sand Rocket/Sand Mustard	0.565974	0.42	0.317803	0.380286	173
<i>Annona glabra</i>	Pond apple	0.694802	0.42	0.258663	0.371028	174
<i>Cirsium vulgare</i>	Spear Thistle	0.693549	0.28	0.353660	0.370875	175
<i>Reseda luteola</i>	Wild Mignonette	0.537021	0.57	0.167145	0.340444	176



Noxious Weeds Review; Phase 3a species

Port Phillip CMA

Present distribution and calculation of potential distribution score

Common name	Scientific name	IPMS		FIS		Regional Estimate		Weight	Estimate based on: regional description, present potential ratio or gut feeling
		# infestations	area of infestation (ha)	# infestations	# infestations	area of infestation			
Cutch tree	<i>Acacia catechu</i>	0	0	0	0	0.100	1.00	PIRVic estimate	
Prickly acacia	<i>Acacia nilotica</i>	0	0	0	0	0.100	1.00	PIRVic estimate	
Annual ragweed	<i>Ambrosia artemisiifolia</i>	0	0	0	0	1.000	0.85	PIRVic estimate	
Burr ragweed	<i>Ambrosia confertiflora</i>	0	0	0	0	1.000	0.85	PIRVic estimate	
Lacy ragweed	<i>Ambrosia tenuifolia</i>	0	0	1	0	1.000	0.85	PIRVic estimate	
Pond apple	<i>Annona glabra</i>	0	0	0	0	0.100	0.42	PIRVic estimate	
Madeira vine	<i>Anredera cordifolia</i>	0	0	30	0	1.000	0.85	PIRVic estimate	
Chinese violet	<i>Asystasia gangetica</i> ssp. <i>Micrantha</i>	0	0	0	0	1.000	0.71	PIRVic estimate	
Barleria, porcupine flower	<i>Barleria prionitis</i>	0	0	0	0	0.100	1.00	PIRVic estimate	
Kochia	<i>Bassia scoparia</i>	0	0	0	0	1.000	0.85	PIRVic estimate	
Cabomba	<i>Cabomba caroliniana</i>	0	0	1	0	0.100	0.71	PIRVic estimate	
Heather	<i>Calluna vulgaris</i>	0	0	0	0	1.000	0.85	PIRVic estimate	
Greater bindweed	<i>Calystegia silvatica</i>	0	0	20	0	1.000	0.85	PIRVic estimate	
Glaucous star thistle	<i>Carthamus glaucus</i>	0	0	0	0	1.000	0.71	PIRVic estimate	
Spotted knapweed	<i>Centaurea maculosa</i> .	0	0	0	0	1.000	0.85	PIRVic estimate	
Siam weed, chromolaena	<i>Chromolaena odorata</i>	0	0	0	0	0.100	1.00	PIRVic estimate	
Rubber vine	<i>Cryptostegia grandiflora</i>	0	0	0	0	0.100	1.00	PIRVic estimate	
Blue hound's tongue	<i>Cynoglossum creticum</i>	0	0	0	0	1.000	0.85	PIRVic estimate	
Cyperus	<i>Cyperus teneristolon</i>	0	0	0	0	1.000	0.57	PIRVic estimate	
African weed-orchid	<i>Disa bracteata</i>	1	8	9	1	8.000	0.71		
False yellowhead	<i>Dittrichia viscosa</i>	0	0	0	0	1.000	0.85	PIRVic estimate	
Senegal tea plant	<i>Gymnocoronis spilanthoides</i>	0	0	0	0	1.000	0.71	PIRVic estimate	
English ivy	<i>Hedera helix</i>	179	353	528	1000+	1,000.000	0.42	gut feeling	
Hymenachne, Olive hymenachne	<i>Hymenachne amplexicaulis</i>	0	0	0	0	0.100	0.85	PIRVic estimate	
Large flowered St John's wort	<i>Hypericum calycinum</i>	0	0	4	0	1.000	0.85	PIRVic estimate	
Canary Island St John's wort	<i>Hypericum canariense</i>	1	0	1	1	1.000	0.85	PIRVic estimate	
Trailing St John's wort	<i>Hypericum humifusum</i>	0	0	1	0	1.000	0.85	PIRVic estimate	
Chinese rain tree	<i>Koelreuteria elegans</i> ssp. <i>formosana</i>	0	0	0	0	0.100	1.00	PIRVic estimate	
Yellow Soldier	<i>Lachenalia reflexa</i>	0	0	0	0	0.100	1.00	PIRVic estimate	
Lantana	<i>Lantana camara</i>	0	0	1	4	0.100	0.42	PIRVic estimate	
Miconia	<i>Miconia</i> spp.	0	0	0	0	0.100	1.00	PIRVic estimate	
Mimosa, giant sensitive plant	<i>Mimosa pigra</i>	0	0	0	0	0.100	1.00	PIRVic estimate	
Thistle	<i>Onopordum dissectum</i>	0	0	0		0.000	1.00	PIRVic estimate	
Cotton thistle	<i>Onopordum nervosum</i>	0	0	0		1.000	0.85	PIRVic estimate	
Taurian thistle	<i>Onopordum tauricum</i>	0	0	0	0	1.000	0.85	PIRVic estimate	
Tiger pear	<i>Opuntia aurantiaca</i>	0	0	40	50+	10.000	0.71	gut feeling	
Parkinsonia	<i>Parkinsonia aculeata</i>	0	0	0	0	0.100	0.85	PIRVic estimate	
Garden geranium	<i>Pelargonium alchemilloides</i>	0	0	0	0	1.000	0.85	PIRVic estimate	
Leaf cactus	<i>Pereskia aculeata</i>	0	0	0	0	1.000	0.85	PIRVic estimate	
Uruguayan rice grass	<i>Piptochaetium montevidense</i>	0	0	1	1	1.000	0.85	PIRVic estimate	
Praxelis	<i>Praxelis clematidea</i>	0	0	0	0	0.100	1.00	PIRVic estimate	
White weeping broom	<i>Retama raetam</i>	0	0	0	0	1.000	0.85	PIRVic estimate	
Giant bramble	<i>Rubus alceifolius</i>	0	0	0	0	1.000	1.00	PIRVic estimate	
Florida blackberry	<i>Rubus argutus</i>	0	0	0	0	1.000	0.71	PIRVic estimate	
Keriberry	<i>Rubus rugosus</i>	0	0	2	0	1.000	0.85	PIRVic estimate	
Arrowhead	<i>Sagittaria montevidensis</i>	0	0	0	0	1.000	0.71	PIRVic estimate	
Delta arrowhead	<i>Sagittaria platyphylla</i>	0	0	0	0	1.000	0.71	PIRVic estimate	
Dwarf arrowhead	<i>Sagittaria pygmaea</i>	0	0	0	0	1.000	1.00	PIRVic estimate	
Willows	<i>Salix alba</i>	0	0	23	200+	23.000	0.42	Region / PIRVic estimate	
Willows	<i>Salix cinerea</i>	0	0	54		54.000	0.57	Region / PIRVic estimate	
Willows	<i>Salix fragilis</i>	0	0	34		34.000	0.42	Region / PIRVic estimate	
Willows	<i>Salix humboldtiana</i>	0	0	0		0.100	0.57	Region / PIRVic estimate	
Willows	<i>Salix matsudana</i>	0	0	0		0.100	0.71	Region / PIRVic estimate	
Willows	<i>Salix nigra</i>	0	0	0		0.100	0.71	Region / PIRVic estimate	
Willows	<i>Salix purpurea</i>	0	0	0		0.100	0.71	Region / PIRVic estimate	
Willows	<i>Salix viminalis</i>	0	0	0		0.100	0.71	Region / PIRVic estimate	
Willows	<i>Salix x pendulina</i>	0	0	3		3.000	0.57	Region / PIRVic estimate	
Willows	<i>Salix x rubens</i>	48	105	99	50	106.350	0.42	Region / PIRVic estimate	
Willows	<i>Salix x sepulcralis</i> ¹	0	0	0		0.100	0.71	Region / PIRVic estimate	
Spotted thistle	<i>Scolymus maculatus</i>	0	0	0	0	1.000	0.71	PIRVic estimate	
Holly leaved senecio	<i>Senecio glastifolius</i>	0	0	0	0	1.000	0.85	PIRVic estimate	
Athel pine, tamarisk	<i>Tamarix aphylla</i>	0	0	0	0	0.100	0.57	PIRVic estimate	
Laurel clock vine	<i>Thunbergia laurifolia</i>	0	0	0	0	0.000	1.00	PIRVic estimate	
Rosewood, tipuana tree	<i>Tipuana tipu</i>	0	0	0	0	0.000	1.00	PIRVic estimate	
Subterranean Cape sedge	<i>Trianoptiles solitaria</i>	0	0	7	1	1.000	0.71	PIRVic estimate	

¹ includes *S. x chrysocoma*

Noxious Weeds Review; Phase 3a species
Port Phillip CMA
Potential distribution by landuse and public land

Common name	Scientific name	Potential area* infested by landuse type						Potential total area
		Horticulture	Broadacre cropping	Forestry	Pasture dryland	Pasture irrigated	Public land	
Cutch tree	<i>Acacia catechu</i>	0	0	0	0	0	0	0
Prickly acacia	<i>Acacia nilotica</i>	0	0	0	526,400	1,755	207,500	735,655
Annual ragweed	<i>Ambrosia artemisiifolia</i>	47,702	0	0	725,821	1,755	8,205	783,483
Burr ragweed	<i>Ambrosia confertiflora</i>	0	0	0	459,316	1,755	11,227	472,298
Lacy ragweed	<i>Ambrosia tenuifolia</i>	0	0	0	725,821	0	8,205	734,026
Pond apple	<i>Annona glabra</i>	0	0	0	0	0	4	4
Madeira vine	<i>Anredera cordifolia</i>	0	0	700	0	0	296,300	297,000
Chinese violet	<i>Asystasia gangetica ssp. micrantha</i>	47,702	0	700	0	0	7,000	55,402
Barleria, porcupine flower	<i>Barleria prionitis</i>	0	0	0	0	0	0	0
Kochia	<i>Bassia scoparia</i>	0	0	0	725,700	0	8,200	733,900
Cabomba	<i>Cabomba caroliniana</i>	0	0	0	0	0	9,300	9,300
Heather	<i>Calluna vulgaris</i>	0	0	700	723,300	0	20,900	744,900
Greater bindweed	<i>Calystegia silvatica</i>	47,702	0	0	725,821	0	266	773,789
Glaucous star thistle	<i>Carthamus glaucus</i>	0	0	0	94,879	0	0	94,879
Spotted knapweed	<i>Centaurea maculosa</i>	0	0	0	683,300	1,755	1,200	686,255
Siam weed, chromolaena	<i>Chromolaena odorata</i>	0	0	0	0	0	0	0
Rubber vine	<i>Cryptostegia grandiflora</i>	0	0	0	0	0	0	0
Blue hound's tongue	<i>Cynoglossum creticum</i>	46,600	0	0	650,100	0	160,300	857,000
Cyperus	<i>Cyperus teneristolon</i>	4,366	0	0	0	0	845	5,211
African weed-orchid	<i>Disa bracteata</i>	0	0	0	683,431	1,755	99,271	784,457
False yellowhead	<i>Dittrichia viscosa</i>	0	0	0	725,821	1,755		727,576
Senegal tea plant	<i>Gymnocoronis spilanthoides</i>	0	0	0	0	1,755	9,800	11,555
English ivy	<i>Hedera helix</i>	0	0	661	0	0	308,794	309,455
Hymenachne, Olive hymenachne	<i>Hymenachne amplexicaulis</i>	0	0	0	95,165	0	2,200	97,365
Large flowered St John's wort	<i>Hypericum calycinum</i>	0	0	0	725,821	1,755	11,227	738,803
Canary Island St John's wort	<i>Hypericum canariense</i>	0	0	0	683,296	1,755	8,205	693,256
Trailing St John's wort	<i>Hypericum humifusum</i>	0	0	0	725,821	1,755	27,924	755,500
Chinese rain tree	<i>Koelreuteria elegans ssp. formosana</i>	0	0	0	0	0	0	0
Yellow Soldier	<i>Lachenalia reflexa</i>	0	0	0	0	0	0	0
Lantana	<i>Lantana camara</i>	0	0	700	725,821	1,755	205,700	933,976
Miconia	<i>Miconia spp.</i>	0	0	0	0	0	0	0
Mimosa, giant sensitive plant	<i>Mimosa pigra</i>	0	0	0	0	0	0	0
Thistle	<i>Onopordum dissectum</i>							N/A
Cotton thistle	<i>Onopordum nervosum</i>	47,172	0	0	683,296	0	26,114	756,582
Taurian thistle	<i>Onopordum tauricum</i>	0	0	0	683,296	1,755	19,121	704,172
Tiger pear	<i>Opuntia aurantiaca</i>	0	0	0	725,821	0	20,707	746,528
Parkinsonia	<i>Parkinsonia aculeata</i>	0	0	0	11,000	0	4,600	15,600
Garden geranium	<i>Pelargonium alchemilloides</i>	0	0	0	725,686	1,755	110,198	837,639
Leaf cactus	<i>Pereskia aculeata</i>	0	0	400	0	0	198,600	199,000
Uruguayan rice grass	<i>Piptochaetium montevidense</i>	0	0	0	683,300	0	1,200	684,500
Praxelis	<i>Praxelis clematidea</i>	0	0	0	0	0	0	0
White weeping broom	<i>Retama raetam</i>	0	0	0	628,911	0	11,227	640,138
Giant bramble	<i>Rubus alceifolius</i>	0	0	0	0	0	0	0
Florida blackberry	<i>Rubus argutus</i>	0	0	0	0	0	59,000	59,000
Keriberry	<i>Rubus rugosus</i>	0	0	0	0	0	186,733	186,733
Arrowhead	<i>Sagittaria montevidensis</i>	0	0	0	0	1,755	9,300	11,055
Delta arrowhead	<i>Sagittaria platyphylla</i>	0	0	0	0	1,755	9,300	11,055
Dwarf arrowhead	<i>Sagittaria pygmaea</i>	0	0	0	0	0	0	0
Willows	<i>Salix alba</i>	0	0	0	0	0	1,505	1,505
Willows	<i>Salix cinerea</i>	0	0	0	0	0	15,575	15,575
Willows	<i>Salix fragilis</i>	0	0	0	0	0	1,505	1,505
Willows	<i>Salix humboldtiana</i>	0	0	0	0	0	57	57
Willows	<i>Salix matsudana</i>	0	0	0	0	0	1,505	1,505
Willows	<i>Salix nigra</i>	0	0	0	0	0	1,326	1,326
Willows	<i>Salix purpurea</i>	0	0	0	0	0	1,505	1,505
Willows	<i>Salix viminalis</i>	0	0	0	0	0	1,505	1,505
Willows	<i>Salix x pendulina</i>	0	0	0	0	0	1,211	1,211
Willows	<i>Salix x rubens</i>	0	0	0	0	0	1,505	1,505
Willows	<i>Salix x sepulcralis</i> ¹	0	0	0	0	0	1,505	1,505
Spotted thistle	<i>Scolymus maculatus</i>	0	0	0	11,033	0	0	11,033
Holly leaved senecio	<i>Senecio glastifolius</i>	0	0	0	725,821	1,755	10,875	738,451
Athel pine, tamarisk	<i>Tamarix aphylla</i>	0	0	0	0	0	898	898
Laurel clock vine	<i>Thunbergia laurifolia</i>	0	0	0	0	0	0	0
Rosewood, tipuana tree	<i>Tipuana tipu</i>	0	0	0	0	0	0	0
Subterranean Cape sedge	<i>Trianoptiles solitaria</i>	0	0	0	0	1,755	85,729	87,484

*unit of measure is hectare
N/A = not available (too few data)

Noxious Weeds Review; Phase 3a species
West Gippsland CMA
Regional score and rank

Scientific name	Common name	Inv. Score	Regional dist.	Impact Score	Regional score	Regional rank	Rank Relative to Phase 1 & 2
<i>Acacia catechu</i>	Cutch tree	0.6061	1.00	0.1080	0.4732	58	142
<i>Acacia nilotica</i>	Prickly acacia	0.5744	1.00	0.5345	0.7082	5	6
<i>Ambrosia artemisiifolia</i>	Annual ragweed	0.5760	0.85	0.2849	0.5177	47	105
<i>Ambrosia confertiflora</i>	Burr ragweed	0.5941	0.85	0.2267	0.4872	55	133
<i>Ambrosia tenuifolia</i>	Lacy ragweed	0.6041	0.57	0.1411	0.3453	65	175
<i>Annona glabra</i>	Pond apple	0.6948	0.71	0.2587	0.4696	61	148
<i>Anredera cordifolia</i>	Madeira vine	0.7660	1.00	0.3585	0.6327	17	34
<i>Asystasia gangetica ssp. micrantha</i>	Chinese violet	0.5931	1.00	0.2305	0.5403	42	88
<i>Barleria prionitis</i>	Barleria, porcupine flower	0.7002	1.00	0.1502	0.5081	50	113
<i>Bassia scoparia</i>	Kochia	0.6106	1.00	0.3563	0.6128	25	43
<i>Cabomba caroliniana</i>	Cabomba	0.6202	0.85	0.4813	0.6330	16	33
<i>Calluna vulgaris</i>	Heather	0.6742	1.00	0.2891	0.5828	32	56
<i>Calystegia silvatica</i>	Greater bindweed	0.3180	0.85	0.2593	0.4724	60	144
<i>Carthamus glaucus</i>	Glaucous star thistle	0.5168	0.71	0.3251	0.4855	56	135
<i>Centaurea maculosa</i>	Spotted knapweed	0.7544	0.85	0.5016	0.6604	12	22
<i>Chromolaena odorata</i>	Siam weed, chromolaena	0.7892	1.00	0.4469	0.6850	8	17
<i>Cryptostegia grandiflora</i>	Rubber vine	0.7574	1.00	0.4880	0.7042	6	7
<i>Cynoglossum creticum</i>	Blue hound's tongue	0.5987	1.00	0.2110	0.5300	44	97
<i>Cyperus teneristolon</i>	Cyperus	0.7330	0.85	0.2058	0.4922	54	127
<i>Disa bracteata</i>	African weed-orchid	0.7635	1.00	0.2567	0.5754	34	59
<i>Dittrichia viscosa</i>	False yellowhead	0.6756	1.00	0.2327	0.5514	40	80
<i>Gymnocoronis spilanthoides</i>	Senegal tea plant	0.4856	1.00	0.3575	0.5985	30	50
<i>Hedera helix</i>	English ivy	0.7455	0.42	0.3875	0.4493	62	154
<i>Hymenachne amplexicaulis</i>	Hymenachne, Olive hymenachne	0.6675	1.00	0.6456	0.7816	2	2
<i>Hypericum calycinum</i>	Large flowered St John's wort	0.5533	0.85	0.3388	0.5451	41	84
<i>Hypericum canariense</i>	Canary Island St John's wort	0.5055	0.85	0.2873	0.5106	49	110
<i>Hypericum humifusum</i>	Trailing St John's wort	0.4552	0.57	0.2088	0.3654	64	174
<i>Koeleria elegans ssp. formosana</i>	Chinese rain tree	0.5911	1.00	0.1677	0.5048	52	116
<i>Lachenalia reflexa</i>	Yellow Soldier	0.4270	1.00	0.3116	0.5657	37	64
<i>Lantana camara</i>	Lantana	0.6496	0.42	0.6372	0.5776	33	57
<i>Miconia spp.</i>	Miconia	0.8664	1.00	0.3037	0.6140	24	42
<i>Mimosa pigra</i>	Mimosa, giant sensitive plant	0.8180	1.00	0.3506	0.6345	14	30
<i>Onopordum dissectum</i>	Thistle	0.4312	1.00	0.3832	0.6063	28	47
<i>Onopordum nervosum</i>	Cotton thistle	0.5962	0.85	0.4685	0.6229	21	39
<i>Onopordum tauricum</i>	Taurian thistle	0.4682	0.85	0.3464	0.5392	43	89
<i>Opuntia aurantiaca</i>	Tiger pear	0.6516	0.85	0.6580	0.7357	4	4
<i>Parkinsonia aculeata</i>	Parkinsonia	0.6416	0.85	0.5568	0.6778	9	18
<i>Pelargonium alchemilloides</i>	Garden geranium	0.6058	0.85	0.3686	0.5681	36	63
<i>Pereskia aculeata</i>	Leaf cactus	0.7889	0.85	0.7331	0.7942	1	1
<i>Piptochaetium montevidense</i>	Uruguayan rice grass	0.7066	0.85	0.3544	0.5723	35	60
<i>Praxelis clematidea</i>	Praxelis	0.7051	1.00	0.3349	0.6121	26	44
<i>Retama raetam</i>	White weeping broom	0.6883	0.85	0.5053	0.6546	13	23
<i>Rubus alceifolius</i>	Giant bramble	0.6207	1.00	0.1977	0.5252	46	102
<i>Rubus argutus</i>	Florida blackberry	0.8084	0.71	0.4430	0.5865	31	55
<i>Rubus rugosus</i>	Keriberry	0.6752	0.85	0.4284	0.6100	27	45
<i>Sagittaria montevidensis</i>	Arrowhead	0.6835	0.85	0.4546	0.6256	18	36
<i>Sagittaria platyphylla</i>	Delta arrowhead	0.6835	0.85	0.4546	0.6256	18	36
<i>Sagittaria pygmaea</i>	Dwarf arrowhead	0.6835	1.00	0.4546	0.6766	11	20
<i>Salix alba</i>	Willows	0.5995	0.57	0.5951	0.5990	29	49
<i>Salix cinerea</i>	Willows	0.9190	0.57	0.6668	0.6775	10	19
<i>Salix fragilis</i>	Willows	0.5141	0.85	0.6283	0.7025	7	9
<i>Salix humboldtiana</i>	Willows	0.5007	0.57	0.3397	0.4441	63	156
<i>Salix matsudana</i>	Willows	0.5980	0.85	0.3534	0.5586	38	72
<i>Salix nigra</i>	Willows	0.5656	0.71	0.5594	0.6225	22	40
<i>Salix purpurea</i>	Willows	0.7995	0.85	0.6302	0.7378	3	3
<i>Salix viminalis</i>	Willows	0.5605	0.85	0.4960	0.6340	15	31
<i>Salix x pendulina</i>	Willows	0.5864	0.85	0.2763	0.5141	48	107
<i>Salix x rubens</i>	Willows	0.6057	0.57	0.6283	0.6183	23	41
<i>Salix x sepulcralis</i>	Willows	0.5920	0.85	0.3534	0.5579	39	73

Noxious Weeds Review; Phase 3a species
West Gippsland CMA
Regional score and rank

Scientific name	Common name	Inv. Score	Regional dist.	Impact Score	Regional score	Regional rank	Rank Relative to Phase 1 & 2
<i>Scolymus maculatus</i>	Spotted thistle	0.7940	0.85	0.2136	0.5039	53	117
<i>Senecio glastifolius</i>	Holly leaved senecio	0.5973	0.85	0.3018	0.5297	45	98
<i>Tamarix aphylla</i>	Athel pine, tamarisk	0.6738	0.57	0.3558	0.4739	57	141
<i>Thunbergia laurifolia</i>	Laurel clock vine	0.4405	1.00	0.4150	0.6253	20	38
<i>Tipuana tipu</i>	Rosewood, tipuana tree	0.4541	1.00	0.1403	0.4731	59	143
<i>Trianoptiles solitaria</i>	Subterranean Cape sedge	0.5107	1.00	0.1887	0.5069	51	115

¹ includes *S. x chrysocoma*



Noxious Weeds Review
West Gippsland CMA
Phase 3a Species: Ranked relative to Phase 1 & 2 (highlighted in red)

Scientific name	Common name	Invasiveness Score	Regional Dist	Impact Scores	Final Score	RANK
<i>Pereskia aculeata</i>	Leaf cactus	0.788886	0.85	0.733119	0.794213	1
<i>Hymenachne amplexicaulis</i>	Hymenachne, Olive hymenachne	0.667534	1.00	0.645600	0.781640	2
<i>Salix purpurea</i>	Willows	0.799511	0.85	0.630180	0.737842	3
<i>Opuntia aurantiaca</i>	Tiger pear	0.651556	0.85	0.657976	0.735653	4
<i>Eichhornia crassipes</i>	Water Hyacinth	0.879335	1	0.527622	0.720989	5
<i>Acacia nilotica</i>	Prickly acacia	0.574417	1.00	0.534471	0.708234	6
<i>Cryptostegia grandiflora</i>	Rubber vine	0.757375	1.00	0.488003	0.704167	7
<i>Orobancha ramosa</i>	Branched Broomrape	0.769900	1	0.519638	0.703385	8
<i>Salix fragilis</i>	Willows	0.514090	0.85	0.628311	0.702545	9
<i>Pennisetum macrourum</i>	African Feather Grass	0.612026	0.85	0.627185	0.696667	10
<i>Acacia erioloba</i>	Giraffe thorn	0.700000	1	0.519638	0.694997	11
<i>Hieracium spp.</i>	Hawkweeds	0.700000	1	0.519638	0.694997	11
<i>Nassella tenuissima</i>	Mexican feather grass	0.700000	1	0.519638	0.694997	11
<i>Acacia karroo</i>	Karoo thorn	0.670000	1	0.519638	0.691397	14
<i>Nassella charruana</i>	Lobed needle grass	0.650000	1	0.519638	0.688997	15
<i>Salvinia molesta</i>	Salvinia	0.587464	1	0.529090	0.686786	16
<i>Chromolaena odorata</i>	Siam weed, chromolaena	0.789234	1.00	0.446929	0.684988	17
<i>Parkinsonia aculeata</i>	Parkinsonia	0.641562	0.85	0.556809	0.677801	18
<i>Salix cinerea</i>	Willows	0.919002	0.57	0.666778	0.677476	19
<i>Sagittaria pygmaea</i>	Dwarf arrowhead	0.683469	1.00	0.454599	0.676592	20
<i>Fallopia japonica, Fallopia sachalinensi</i>	Japanese and Giant knotweed	0.506400	1	0.519638	0.671765	21
<i>Centaurea maculosa .</i>	Spotted knapweed	0.754357	0.85	0.501646	0.660445	22
<i>Retama raetam</i>	White weeping broom	0.688328	0.85	0.505316	0.654576	23
<i>Parthenium hysterophorus</i>	Parthenium Weed	0.825166	1	0.420087	0.654269	24
<i>Nassella trichotoma</i>	Serrated Tussock	0.761536	0.57	0.675277	0.651939	25
<i>Equisetum spp.</i>	Horsetails	0.726000	0.85	0.519638	0.650117	26
<i>Alternanthera philoxeroides</i>	Alligator Weed	0.527352	0.57	0.719621	0.648670	27
<i>Prosopis spp.</i>	Mesquite	0.658431	0.85	0.521093	0.642824	28
<i>Iva axillaris</i>	Poverty Weed	0.538501	1	0.453036	0.638320	29
<i>Mimosa pigra</i>	Mimosa, giant sensitive plant	0.818008	1.00	0.350578	0.634484	30
<i>Salix viminalis</i>	Willows	0.560486	0.85	0.495981	0.634008	31
<i>Rubus fruticosus agg.</i>	Blackberry	0.767146	0.42	0.726464	0.633277	32
<i>Cabomba caroliniana</i>	Cabomba	0.620155	0.85	0.481313	0.632954	33
<i>Anredera cordifolia</i>	Madeira vine	0.766046	1.00	0.358456	0.632661	34
<i>Xanthium spinosum</i>	Noogoora Burr/ Californian Burr	0.619536	0.85	0.500315	0.626521	35
<i>Sagittaria montevidensis</i>	Arrowhead	0.683469	0.85	0.454599	0.625592	36
<i>Sagittaria platyphylla</i>	Delta arrowhead	0.683469	0.85	0.454599	0.625592	36
<i>Thunbergia laurifolia</i>	Laurel clock vine	0.440524	1.00	0.415005	0.625266	38
<i>Onopordum nervosum</i>	Cotton thistle	0.596175	0.85	0.468505	0.622904	39
<i>Salix nigra</i>	Willows	0.565578	0.71	0.559364	0.622513	40
<i>Salix x rubens</i>	Willows	0.605670	0.57	0.628311	0.618335	41
<i>Miconia spp.</i>	Miconia	0.866385	1.00	0.303706	0.614041	42
<i>Bassia scoparia</i>	Kochia	0.610614	1.00	0.356267	0.612783	43
<i>Praxelis clematidea</i>	Praxelis	0.705095	1.00	0.334863	0.612135	44
<i>Rubus rugosus</i>	Keriberry	0.675226	0.85	0.428443	0.609955	45
<i>Convolvulus arvensis</i>	Bindweed	0.779101	0.85	0.430366	0.606497	46
<i>Onopordum dissectum</i>	Thistle	0.431190	1.00	0.383170	0.606318	47
<i>Echium vulgare</i>	Viper's Bugloss	0.655865	0.85	0.446556	0.600775	48
<i>Salix alba</i>	Willows	0.599482	0.57	0.595056	0.598969	49
<i>Gymnocoronis spilanthoides</i>	Senegal tea plant	0.485586	1.00	0.357542	0.598494	50
<i>Lagarosiphon major</i>	Lagarosiphon	0.649037	1	0.342517	0.589694	51
<i>Homeria flaccida</i>	Cape Tulip (two-leaf)	0.684162	0.85	0.417379	0.587832	52
<i>Centaurea solstitialis</i>	St. Barnaby's Thistle	0.655091	0.85	0.423400	0.587715	53
<i>Ulex europaeus</i>	Furze/Gorse	0.828248	0.57	0.545087	0.587038	54
<i>Rubus argutus</i>	Florida blackberry	0.808417	0.71	0.442982	0.586480	55
<i>Calluna vulgaris</i>	Heather	0.674172	1.00	0.289081	0.582786	56
<i>Lantana camara</i>	Lantana	0.649647	0.42	0.637247	0.577616	57
<i>Acroptilon repens</i>	Hardheads/Russian Knapweed	0.514006	0.85	0.434553	0.577030	58
<i>Disa bracteata</i>	African weed-orchid	0.763497	1.00	0.256714	0.575379	59
<i>Piptochaetium montevidense</i>	Uruguayan rice grass	0.706617	0.85	0.354400	0.572258	60
<i>Nassella neesiana</i>	Chilean needle grass	0.686622	0.57	0.543816	0.569332	61
<i>Cirsium arvense</i>	Californian/Perennial Thistle	0.702729	0.71	0.458673	0.568385	62
<i>Pelargonium alchemilloides</i>	Garden geranium	0.605828	0.85	0.368643	0.568139	63
<i>Lachenalia reflexa</i>	Yellow Soldier	0.426976	1.00	0.311622	0.565746	64
<i>Homeria miniata</i>	Cape Tulip (one-leaf)	0.747658	0.71	0.440860	0.563800	65
<i>Rosa rubiginosa</i>	Sweet Briar	0.793721	0.57	0.508953	0.562660	66
<i>Cytisus scoparius</i>	English Broom	0.734874	0.57	0.520938	0.562310	67
<i>Onopordum illyricum</i>	Illyrian Thistle	0.533147	0.85	0.401999	0.561097	68

Noxious Weeds Review
West Gippsland CMA
Phase 3a Species: Ranked relative to Phase 1 & 2 (highlighted in red)

Scientific name	Common name	Invasiveness Score	Regional Dist	Impact Scores	Final Score	RANK
<i>Datura ferox</i>	Thorn Apple (common)	0.703633	0.71	0.444751	0.560697	69
<i>Datura stramonium</i>	Thorn Apple (longspine)	0.703600	0.71	0.444751	0.560693	70
<i>Datura inoxia</i>	Thorn Apple (recurved)	0.703600	0.71	0.444751	0.560693	70
<i>Salix matsudana</i>	Willows	0.598025	0.85	0.353359	0.558644	72
<i>Salix x sepulcralis</i>¹	Willows	0.592031	0.85	0.353359	0.557925	73
<i>Alhagi maurorum</i>	Camelthorn	0.569959	0.85	0.386286	0.556715	74
<i>Cuscuta</i> spp.	Dodder	0.734033	0.71	0.429397	0.555746	75
<i>Hypericum triquetrifolium</i>	Tangled Hypericum	0.602251	0.85	0.377231	0.555520	76
<i>Cannabis sativa</i>	Marijuana	0.565385	1	0.297461	0.554424	77
<i>Onopordum acanthium</i>	Scotch/Heraldic Thistle	0.571238	0.85	0.381627	0.554260	78
<i>Allium triquetrum</i>	Angled Onion	0.614461	0.71	0.448094	0.551868	79
<i>Dirtrichia viscosa</i>	False yellowhead	0.675616	1.00	0.232653	0.551360	80
<i>Tribulus terrestris</i>	Caltrop	0.606654	0.85	0.368584	0.551205	81
<i>Festuca gautieri</i>	bearskin fescue	0.491440	0.85	0.387816	0.548150	82
<i>Amsinckia</i> spp.	Amsinckia	0.745464	0.85	0.333240	0.548070	83
<i>Hypericum calycinum</i>	Large flowered St John's wort	0.553290	0.85	0.338782	0.545113	84
<i>Salpichroa origanifolia</i>	Pampas Lily-of-the-Valley	0.762638	0.85	0.320066	0.542753	85
<i>Opuntia robusta</i>	Wheel Cactus	0.645158	0.85	0.345016	0.542628	86
<i>Senecio pterophorus</i>	African Daisy	0.676556	0.85	0.337358	0.542107	87
<i>Asystasia gangetica</i> ssp. <i>micram</i>	Chinese violet	0.593129	1.00	0.230522	0.540268	88
<i>Onopordum tauricum</i>	Taurian thistle	0.468246	0.85	0.346370	0.539157	89
<i>Chondrilla juncea</i>	Skeleton Weed	0.742382	0.85	0.315662	0.537856	90
<i>Ailanthus altissima</i>	Tree of Heaven	0.895314	0.57	0.441183	0.536900	91
<i>Cardaria draba</i>	Hoary Cress	0.563497	0.71	0.429138	0.535137	92
<i>Ambrosia psilostachya</i>	Perennial Ragweed	0.489293	0.85	0.364356	0.534755	93
<i>Eragrostis curvula</i>	African Lovegrass	0.715330	0.85	0.314456	0.533935	94
<i>Opuntia stricta</i>	Prickly Pear (drooping)	0.552003	0.85	0.345016	0.531449	95
<i>Lavandula stoechas</i>	Topped Lavender	0.682210	0.85	0.316423	0.531062	96
<i>Cynoglossum creticum</i>	Blue hound's tongue	0.598661	1.00	0.210974	0.529985	97
<i>Senecio glastifolius</i>	Holly leaved senecio	0.597307	0.85	0.301771	0.529669	98
<i>Marrubium vulgare</i>	Horehound	0.771737	0.57	0.451853	0.528046	99
<i>Lycium ferocissimum</i>	Boxthorn	0.674957	0.57	0.470710	0.526993	100
<i>Centaurea nigra</i>	Black Knapweed	0.641607	0.85	0.317275	0.526667	101
<i>Rubus alceifolius</i>	Giant bramble	0.620743	1.00	0.197677	0.525188	102
<i>Alternanthera pungens</i>	Khaki Weed	0.653479	0.85	0.303604	0.520436	103
<i>Cytisus multiflorus</i>	white Spanish broom	0.517034	0.85	0.330775	0.519278	104
<i>Ambrosia artemisiifolia</i>	Annual ragweed	0.575985	0.85	0.284903	0.517664	105
<i>Cestrum parqui</i>	Chilean Cestrum	0.727801	0.71	0.358471	0.515280	106
<i>Salix x pendulina</i>	Willows	0.586438	0.85	0.276310	0.514106	107
<i>Conium maculatum</i>	Hemlock	0.665290	0.57	0.446703	0.512388	108
<i>Opuntia vulgaris</i>	Prickly Pear (erect)	0.759228	0.71	0.345016	0.511516	109
<i>Hypericum canariense</i>	Canary Island St John's wort	0.505525	0.85	0.287333	0.510570	110
<i>Sagittaria graminea</i>	Arrowhead	0.586551	0.85	0.298489	0.509540	111
<i>Sida leprosa</i>	Ivy-leaved Sida	0.485639	1	0.234041	0.509339	112
<i>Barleria prionitis</i>	Barleria, porcupine flower	0.700199	1.00	0.150169	0.508118	113
<i>Solanum elaeagnifolium</i>	Silverleaf Nightshade	0.667968	0.71	0.357925	0.507794	114
<i>Trianoptiles solitaria</i>	Subterranean Cape sedge	0.510665	1.00	0.188664	0.506932	115
<i>Koeleruteria elegans</i> ssp. <i>formos</i>	Chinese rain tree	0.591073	1.00	0.167702	0.504842	116
<i>Scolymus maculatus</i>	Spotted thistle	0.794014	0.85	0.213592	0.503893	117
<i>Calicotome spinosa</i>	Spiny Broom	0.447135	0.85	0.317558	0.503489	118
<i>Crataegus monogyna</i>	Hawthorn	0.704590	0.42	0.506902	0.502816	119
<i>Spartium junceum</i>	Spanish broom	0.341815	0.85	0.33587	0.501105	120
<i>Scolymus hispanicus</i>	Golden Thistle	0.497723	0.71	0.377717	0.498448	121
<i>Hypericum tetrapterum</i>	St. Peter's Wort	0.552896	0.85	0.284303	0.497557	122
<i>Cenchrus longispinus</i>	Spiny Burr Grass/ Gentle Annie	0.402417	0.85	0.313125	0.495640	123
<i>Onopordum acaulon</i>	Stemless Thistle	0.528267	0.85	0.285015	0.495001	124
<i>Cynara cardunculus</i>	Artichoke Thistle	0.662745	0.57	0.413264	0.493358	125
<i>Echium plantagineum</i>	Paterson's Curse	0.665066	0.57	0.412722	0.493332	126
<i>Cyperus teneristolon</i>	Cyperus	0.732975	0.85	0.205759	0.492182	127
<i>Silybum marianum</i>	Variegated Thistle	0.765111	0.57	0.387726	0.491340	128
<i>Centaurea calcitrapa</i>	Star Thistle	0.408196	0.85	0.303943	0.491192	129
<i>Juncus acutus</i>	Spiny Rush	0.516930	0.57	0.438554	0.490022	130
<i>Carduus nutans</i>	Nodding Thistle	0.390918	0.85	0.302426	0.488269	131
<i>Physalis viscosa</i>	Prairie Ground Cherry	0.727781	0.71	0.309365	0.487778	132
<i>Ambrosia confertiflora</i>	Burr ragweed	0.594088	0.85	0.226697	0.487241	133
<i>Genista linifolia</i>	Flax Leaved Broom	0.703726	0.57	0.392163	0.486458	134
<i>Carthamus glaucus</i>	Glaucous star thistle	0.516750	0.71	0.325102	0.485467	135
<i>Nassella hyalina</i>	cane needle grass	0.503576	0.85	0.267807	0.482401	136

Noxious Weeds Review
West Gippsland CMA
Phase 3a Species: Ranked relative to Phase 1 & 2 (highlighted in red)

Scientific name	Common name	Invasiveness Score	Regional Dist	Impact Scores	Final Score	RANK
<i>Ibicella lutea</i>	Devil's Claw (yellowflower)	0.616016	0.85	0.241384	0.481097	137
<i>Asparagus asparagoides</i>	bridal creeper	0.782848	0.57	0.361907	0.479010	138
<i>Emex australis</i>	Spiny Emex	0.535113	0.85	0.247396	0.474755	139
<i>Cirsium acarna</i>	Soldier Thistle	0.523968	0.85	0.249563	0.474632	140
<i>Tamarix aphylla</i>	Athel pine, tamarisk	0.673811	0.57	0.355786	0.473897	141
<i>Acacia catechu</i>	Cutch tree	0.606058	1.00	0.107969	0.473190	142
<i>Tipuana tipu</i>	Rosewood, tipuana tree	0.454073	1.00	0.140342	0.473080	143
<i>Calystegia silvatica</i>	Greater bindweed	0.317991	0.85	0.259324	0.472380	144
<i>Proboscidea louisianica</i>	Devil's Claw (purpleflower)	0.542172	0.85	0.241384	0.472236	145
<i>Hypericum androsaemum</i>	Tutsan	0.746650	0.71	0.276452	0.471611	146
<i>Solanum rostratum</i>	Buffalo Burr	0.468698	0.85	0.254399	0.470707	147
<i>Annona glabra</i>	Pond apple	0.694802	0.71	0.258663	0.469628	148
<i>Carthamus lanatus</i>	Saffron Thistle	0.499430	0.57	0.405518	0.469422	149
<i>Carduus tenuiflorus</i> / <i>C. pycnocephalus</i>	Slender/Shore Thistle	0.608219	0.57	0.359060	0.456460	150
<i>Pittosporum undulatum</i>	sweet pittosporum	0.793704	0.57	0.315117	0.454110	151
<i>Genista monspessulana</i>	Cape Broom /Montpellier Broom	0.698418	0.42	0.419839	0.453320	152
<i>Xanthium strumarium</i>	Bathurst Burr	0.585163	0.57	0.356250	0.452120	153
<i>Hedera helix</i>	English ivy	0.745474	0.42	0.387495	0.449254	154
<i>Hypericum perforatum</i>	St. John's Wort	0.660601	0.57	0.334271	0.448864	155
<i>Salix humboltiana</i>	Willows	0.500663	0.57	0.339666	0.444093	156
<i>Leucanthemum vulgare</i>	Ox-eye Daisy	0.610238	0.57	0.333108	0.442169	157
<i>Chrysanthemoides monilifera</i>	Boneseed/Bitou Bush	0.799614	0.42	0.375091	0.440405	158
<i>Nassella leucotricha</i>	Texas needle grass	0.627929	0.57	0.326146	0.440393	159
<i>Dittrichia graveolens</i>	Stinkwort	0.607585	0.57	0.319717	0.434352	160
<i>Senecio jacobaea</i>	Ragwort	0.776347	0.42	0.363784	0.431281	161
<i>Vinca major</i>	blue periwinkle	0.703021	0.57	0.289181	0.428704	162
<i>Dipsacus fullonum</i>	Wild Teasel	0.551563	0.57	0.309552	0.421937	163
<i>Allium vineale</i>	Wild Garlic	0.658241	0.57	0.285822	0.421449	164
<i>Melianthus comosus</i>	Tufted Honeyflower	0.492463	0.42	0.394016	0.414144	165
<i>Solanum linnaeanum</i>	Apple of Sodom	0.356227	0.57	0.325025	0.407161	166
<i>Verbascum thapsus</i>	Great Mullein	0.474171	0.57	0.296038	0.405082	167
<i>Watsonia meriana</i> 'Bulbillifera'	Wild Watsonia	0.402004	0.57	0.307647	0.402923	168
<i>Foeniculum vulgare</i>	Fennel	0.574220	0.42	0.326980	0.386415	169
<i>Oxalis pes-caprae</i>	Soursob	0.743995	0.28	0.365451	0.383532	170
<i>Asphodelus fistulosus</i>	Onion Weed	0.539790	0.42	0.328848	0.383330	171
<i>Diplotaxis tenuifolia</i>	Sand Rocket/Sand Mustard	0.565974	0.42	0.317803	0.380286	172
<i>Cirsium vulgare</i>	Spear Thistle	0.693549	0.28	0.353660	0.370875	173
<i>Hypericum humifusum</i>	Trailing St John's wort	0.455230	0.57	0.208817	0.365365	174
<i>Ambrosia tenuifolia</i>	Lacy ragweed	0.604084	0.57	0.141134	0.345325	175
<i>Reseda luteola</i>	Wild Mignonette	0.537021	0.57	0.167145	0.340444	176



Noxious Weeds Review; Phase 3a species
West Gippsland CMA
Present distribution and calculation of potential distribution score

Common name	Scientific name	IPMS	area of infestation (ha)	FIS	Regional Estimate		Weight	Estimate based on: regional description, present potential ratio or gut feeling
		# infestations		# infestations	# infestations	area of infestation		
Cutch tree	<i>Acacia catechu</i>	0	0	0	0	1.000	1.00	PIRVic estimate
Prickly acacia	<i>Acacia nilotica</i>	0	0	0	0	0.100	1.00	PIRVic estimate
Annual ragweed	<i>Ambrosia artemisiifolia</i>	0	0	1	0	1.000	0.85	PIRVic estimate
Burr ragweed	<i>Ambrosia confertiflora</i>	0	0	0	0	1.000	0.85	PIRVic estimate
Lacy ragweed	<i>Ambrosia tenuifolia</i>	0	0	0	0	1.000	0.57	PIRVic estimate
Pond apple	<i>Annona glabra</i>	0	0	0	0	0.100	0.71	PIRVic estimate
Madeira vine	<i>Anredera cordifolia</i>	0	0	0	0	0.100	1.00	PIRVic estimate
Chinese violet	<i>Asystasia gangetica ssp. Micrantha</i>	0	0	0	0	0.100	1.00	PIRVic estimate
Barleria, porcupine flower	<i>Barleria prionitis</i>	0	0	0	0	0.100	1.00	PIRVic estimate
Kochia	<i>Bassia scoparia</i>	0	0	0	0	0.100	1.00	PIRVic estimate
Cabomba	<i>Cabomba caroliniana</i>	0	0	2	0	0.100	0.85	PIRVic estimate
Heather	<i>Calluna vulgaris</i>	0	0	0	0	0.100	1.00	PIRVic estimate
Greater bindweed	<i>Calystegia silvatica</i>	0	0	0	0	1.000	0.85	PIRVic estimate
Glaucous star thistle	<i>Carthamus glaucus</i>	0	0	0	0	1.000	0.71	PIRVic estimate
Spotted knapweed	<i>Centaurea maculosa</i>	0	0	0	0	1.000	0.85	PIRVic estimate
Siam weed, chromolaena	<i>Chromolaena odorata</i>	0	0	0	0	0.100	1.00	PIRVic estimate
Rubber vine	<i>Cryptostegia grandiflora</i>	0	0	0	0	0.100	1.00	PIRVic estimate
Blue hound's tongue	<i>Cynoglossum creticum</i>	0	0	0	0	0.100	1.00	PIRVic estimate
Cyperus	<i>Cyperus teneristolon</i>	0	0	0	0	0.100	0.85	PIRVic estimate
African weed-orchid	<i>Disa bracteata</i>	0	0	0	0	1.000	1.00	PIRVic estimate
False yellowhead	<i>Dittrichia viscosa</i>	0	0	0	0	0.100	1.00	PIRVic estimate
Senegal tea plant	<i>Gymnocoronis spilanthoides</i>	0	0	0	0	0.100	1.00	PIRVic estimate
English ivy	<i>Hedera helix</i>	9	12	28		100.000	0.42	TNC
Hymenachne, Olive hymenachne	<i>Hymenachne amplexicaulis</i>	0	0	0	0	0.100	1.00	PIRVic estimate
Large flowered St John's wort	<i>Hypericum calycinum</i>	0	0	1	0	1.000	0.85	PIRVic estimate
Canary Island St John's wort	<i>Hypericum canariense</i>	0	0	0	0	1.000	0.85	PIRVic estimate
Trailing St John's wort	<i>Hypericum humifusum</i>	0	0	3	0	1.000	0.57	PIRVic estimate
Chinese rain tree	<i>Koelreuteria elegans ssp. formosana</i>	0	0	0	0	0.100	1.00	PIRVic estimate
Yellow Soldier	<i>Lachenalia reflexa</i>	0	0	0	0	0.100	1.00	PIRVic estimate
Lantana	<i>Lantana camara</i>	0	0	0	0	0.100	0.42	PIRVic estimate
Miconia	<i>Miconia spp.</i>	0	0	0	0	1.000	1.00	PIRVic estimate
Mimosa, giant sensitive plant	<i>Mimosa pigra</i>	0	0	0	0	0.100	1.00	PIRVic estimate
Thistle	<i>Onopordum dissectum</i>	0	0	0	0	0.000	1.00	PIRVic estimate
Cotton thistle	<i>Onopordum nervosum</i>	0	0	0	0	1.000	0.85	PIRVic estimate
Taurian thistle	<i>Onopordum tauricum</i>	0	0	0	0	1.000	0.85	PIRVic estimate
Tiger pear	<i>Opuntia aurantiaca</i>	0	0	1	0	1.000	0.85	PIRVic estimate
Parkinsonia	<i>Parkinsonia aculeata</i>	0	0	0	0	0.100	0.85	PIRVic estimate
Garden geranium	<i>Pelargonium alchemilloides</i>	0	0	0	0	1.000	0.85	PIRVic estimate
Leaf cactus	<i>Pereskia aculeata</i>	0	0	0	0	1.000	0.85	PIRVic estimate
Uruguayan rice grass	<i>Piptochaetium montevidense</i>	0	0	0	0	1.000	0.85	PIRVic estimate
Praxelis	<i>Praxelis clematidea</i>	0	0	0	0	1.000	1.00	PIRVic estimate
White weeping broom	<i>Retama raetam</i>	0	0	0	0	1.000	0.85	PIRVic estimate
Giant bramble	<i>Rubus alceifolius</i>	0	0	0	0	1.000	1.00	PIRVic estimate
Florida blackberry	<i>Rubus argutus</i>	0	0	0	0	1.000	0.71	PIRVic estimate
Keriberry	<i>Rubus rugosus</i>	0	0	0	0	1.000	0.85	PIRVic estimate
Arrowhead	<i>Sagittaria montevidensis</i>	0	0	0	0	1.000	0.85	PIRVic estimate
Delta arrowhead	<i>Sagittaria platyphylla</i>	0	0	0	0	1.000	0.85	PIRVic estimate
Dwarf arrowhead	<i>Sagittaria pygmaea</i>	0	0	0	0	1.000	1.00	PIRVic estimate
Willows	<i>Salix alba</i>	0	0	6		6.000	0.57	**TNC (PIRVic est. (FIS))
Willows	<i>Salix cinerea</i>	0	0	23		23.000	0.57	**TNC (PIRVic est. (FIS))
Willows	<i>Salix fragilis</i>	0	0	0		0.100	0.85	**TNC (PIRVic est. (FIS))
Willows	<i>Salix humboldtiana</i>	0	0	0		0.100	0.57	**TNC (PIRVic est. (FIS))
Willows	<i>Salix matsudana</i>	0	0	0		0.100	0.85	**TNC (PIRVic est. (FIS))
Willows	<i>Salix nigra</i>	0	0	1		1.000	0.71	**TNC (PIRVic est. (FIS))
Willows	<i>Salix purpurea</i>	0	0	0		0.100	0.85	**TNC (PIRVic est. (FIS))
Willows	<i>Salix viminalis</i>	0	0	0		0.100	0.85	**TNC (PIRVic est. (FIS))
Willows	<i>Salix x pendulina</i>	0	0	0		0.100	0.85	**TNC (PIRVic est. (FIS))
Willows	<i>Salix x rubens</i>	2	2	4		4.000	0.57	**TNC (PIRVic est. (FIS))
Willows	<i>Salix x sepulcralis</i> ¹	0	0	0		0.100	0.85	**TNC (PIRVic est. (FIS))
Spotted thistle	<i>Scolymus maculatus</i>	0	0	0	0	1.000	0.85	PIRVic estimate
Holly leaved senecio	<i>Senecio glastifolius</i>	0	0	0	0	1.000	0.85	PIRVic estimate
Athel pine, tamarisk	<i>Tamarix aphylla</i>	0	0	0	0	0.100	0.57	PIRVic estimate
Laurel clock vine	<i>Thunbergia laurifolia</i>	0	0	0	0	0.100	1.00	PIRVic estimate
Rosewood, tipuana tree	<i>Tipuana tipu</i>	0	0	0	0	0.100	1.00	PIRVic estimate
Subterranean Cape sedge	<i>Trianoptiles solitaria</i>	0	0	0	0	0.100	1.00	PIRVic estimate

¹ includes *S. x chrysocoma*

* NO KNOWN INFESTATIONS

** TNC -UNABLE TO DISTINGUISH DIFFERENT SPECIES-TOTAL TOO NUMEROUS TO COUNT



Return to map

Noxious Weeds Review; Phase 3a species
West Gippsland CMA
Potential distribution by landuse and public land

Common name	Scientific name	Potential area* infested by landuse type						Potential total area
		Horticulture	Broadacre cropping	Forestry	Pasture dryland	Pasture irrigated	Public land	
Cutch tree	<i>Acacia catechu</i>	0	0	0	0	0	0	0
Prickly acacia	<i>Acacia nilotica</i>	0	0	0	443,500	61,100	447,000	951,600
Annual ragweed	<i>Ambrosia artemisiifolia</i>	18,098	0	0	710,423	70,155	22,272	820,948
Burr ragweed	<i>Ambrosia confertiflora</i>	0	0	0	414,443	61,049	20,492	495,984
Lacy ragweed	<i>Ambrosia tenuifolia</i>	0	0	0	8,166	0	636	8,802
Pond apple	<i>Annona glabra</i>	0	0	0	0	0	1,500	1,500
Madeira vine	<i>Anredera cordifolia</i>	0	0	68,700	0	0	774,600	843,300
Chinese violet	<i>Asystasia gangetica ssp. micrantha</i>	18,098	0	68,600	0	0	21,600	108,298
Barleria, porcupine flower	<i>Barleria prionitis</i>	0	0	0	0	0	0	0
Kochia	<i>Bassia scoparia</i>	0	0	0	710,423	0	22,300	732,723
Cabomba	<i>Cabomba caroliniana</i>	0	0	0	0	0	39,300	39,300
Heather	<i>Calluna vulgaris</i>	0	0	68,700	710,423	0	120,100	899,223
Greater bindweed	<i>Calystegia silvatica</i>	18,098	0	0	710,423	0	391	728,912
Glaucous star thistle	<i>Carthamus glaucus</i>	0	0	0	59,655	0	0	59,655
Spotted knapweed	<i>Centaurea maculosa</i>	0	0	0	710,423	70,155	17,100	797,678
Siam weed, chromolaena	<i>Chromolaena odorata</i>	0	0	0	0	0	0	0
Rubber vine	<i>Cryptostegia grandiflora</i>	0	0	0	0	0	0	0
Blue hound's tongue	<i>Cynoglossum creticum</i>	7,000	0	0	622,800	0	328,100	957,900
Cyperus	<i>Cyperus teneristolon</i>	0	0	0	0	61,049	0	61,049
African weed-orchid	<i>Disa bracteata</i>	0	0	0	710,423	70,155	374,146	1,154,724
False yellowhead	<i>Dittrichia viscosa</i>	0	0	0	710,423	70,155	19,719	800,297
Senegal tea plant	<i>Gymnocoronis spilanthoides</i>	0	0	0	0	70,155	57,700	127,855
English ivy	<i>Hedera helix</i>	0	0	68,658	0	0	831,951	900,609
Hymenachne, Olive hymenachne	<i>Hymenachne amplexicaulis</i>	0	0	0	272,058	0	15,455	287,513
Large flowered St John's wort	<i>Hypericum calycinum</i>	0	0	0	710,423	70,155	37,330	817,908
Canary Island St John's wort	<i>Hypericum canariense</i>	0	0	0	710,383	70,155	21,056	801,594
Trailing St John's wort	<i>Hypericum humifusum</i>	0	0	0	87	6	89	182
Chinese rain tree	<i>Koelreuteria elegans ssp. formosana</i>	0	0	0	0	0	0	0
Yellow Soldier	<i>Lachenalia reflexa</i>	0	0	0	0	0	0	0
Lantana	<i>Lantana camara</i>	0	0	68,700	710,423	70,155	559,700	1,408,978
Miconia	<i>Miconia spp.</i>	0	0	0	0	0	0	0
Mimosa, giant sensitive plant	<i>Mimosa pigra</i>	0	0	0	0	0	0	0
Thistle	<i>Onopordum dissectum</i>							N/A
Cotton thistle	<i>Onopordum nervosum</i>	18,098	0	0	568,044	0	48,532	634,674
Taurian thistle	<i>Onopordum tauricum</i>	0	0	0	482,013	0	28,669	510,682
Tiger pear	<i>Opuntia aurantiaca</i>	0	0	0	710,423	0	112,810	823,233
Parkinsonia	<i>Parkinsonia aculeata</i>	0	0	0	800	0	98,500	99,300
Garden geranium	<i>Pelargonium alchemilloides</i>	0	0	0	709,656	70,123	178,176	957,955
Leaf cactus	<i>Pereskia aculeata</i>	0	0	43,100	0	0	342,900	386,000
Uruguayan rice grass	<i>Piptochaetium montevidense</i>	0	0	0	568,000	0	1,700	569,700
Praxelis	<i>Praxelis clematidea</i>	0	0	0	0	0	0	0
White weeping broom	<i>Retama raetam</i>	0	0	0	565,804	0	31,023	596,827
Giant bramble	<i>Rubus alceifolius</i>	0	0	0	0	0	0	0
Florida blackberry	<i>Rubus argutus</i>	0	0	0	0	0	10,900	10,900
Keriberry	<i>Rubus rugosus</i>	0	0	0	0	0	377,042	377,042
Arrowhead	<i>Sagittaria montevidensis</i>	0	0	0	0	70,155	55,400	125,555
Delta arrowhead	<i>Sagittaria platyphylla</i>	0	0	0	0	70,155	55,400	125,555
Dwarf arrowhead	<i>Sagittaria pygmaea</i>	0	0	0	0	0	0	0
Willows	<i>Salix alba</i>	0	0	0	0	0	18,490	18,490
Willows	<i>Salix cinerea</i>	0	0	0	0	0	69,556	69,556
Willows	<i>Salix fragilis</i>	0	0	0	0	0	18,490	18,490
Willows	<i>Salix humboldtiana</i>	0	0	0	0	0	40	40
Willows	<i>Salix matsudana</i>	0	0	0	0	0	18,490	18,490
Willows	<i>Salix nigra</i>	0	0	0	0	0	18,490	18,490
Willows	<i>Salix purpurea</i>	0	0	0	0	0	18,490	18,490
Willows	<i>Salix viminalis</i>	0	0	0	0	0	18,490	18,490
Willows	<i>Salix x pendulina</i>	0	0	0	0	0	18,459	18,459
Willows	<i>Salix x rubens</i>	0	0	0	0	0	18,490	18,490
Willows	<i>Salix x sepulcralis</i> ¹	0	0	0	0	0	18,490	18,490
Spotted thistle	<i>Scolymus maculatus</i>	0	0	0	142,385	61,049	653	204,087
Holly leaved senecio	<i>Senecio glastifolius</i>	0	0	0	710,423	70,155	49,183	829,761
Athel pine, tamarisk	<i>Tamarix aphylla</i>	0	0	0	0	0	40	40
Laurel clock vine	<i>Thunbergia laurifolia</i>	0	0	0	0	0	0	0
Rosewood, tipuana tree	<i>Tipuana tipu</i>	0	0	0	0	0	0	0
Subterranean Cape sedge	<i>Trianoptiles solitaria</i>	0	0	0	0	9,106	345,630	354,736

*unit of measure is hectare
N/A = not available (too few data)
¹ includes *S. x chrysocoma*

Noxious Weeds Review; Phase 3a species
Wimmera CMA
Regional score and rank

Scientific name	Common name	Inv. Score	Regional dist.	Impact Score	Regional score	Regional rank	Rank Relative to Phase 1*
<i>Acacia catechu</i>	Cutch tree	0.6061	1.00	0.1080	0.4732	55	138
<i>Acacia nilotica</i>	Prickly acacia	0.5744	1.00	0.5345	0.7082	5	6
<i>Ambrosia artemisiifolia</i>	Annual ragweed	0.5760	1.00	0.2849	0.5687	35	61
<i>Ambrosia confertiflora</i>	Burr ragweed	0.5941	1.00	0.2267	0.5382	44	90
<i>Ambrosia tenuifolia</i>	Lacy ragweed	0.6041	0.85	0.1411	0.4405	63	156
<i>Annona glabra</i>	Pond apple	0.6948	1.00	0.2587	0.5682	36	63
<i>Anredera cordifolia</i>	Madeira vine	0.7660	0.85	0.3585	0.5817	30	54
<i>Asystasia gangetica</i> ssp. <i>micrantha</i>	Chinese violet	0.5931	0.85	0.2305	0.4893	54	170
<i>Barleria prionitis</i>	Barleria, porcupine flower	0.7002	1.00	0.1502	0.5081	52	115
<i>Bassia scoparia</i>	Kochia	0.6106	1.00	0.3563	0.6128	26	44
<i>Cabomba caroliniana</i>	Cabomba	0.6202	0.85	0.4813	0.6330	19	36
<i>Calluna vulgaris</i>	Heather	0.6742	0.85	0.2891	0.5318	45	96
<i>Calystegia silvatica</i>	Greater bindweed	0.3180	0.85	0.2593	0.4724	57	140
<i>Carthamus glaucus</i>	Glaucous star thistle	0.5168	1.00	0.3251	0.5841	29	53
<i>Centaurea maculosa</i>	Spotted knapweed	0.7544	0.85	0.5016	0.6604	15	25
<i>Chromolaena odorata</i>	Siam weed, chromolaena	0.7892	1.00	0.4469	0.6850	11	20
<i>Cryptostegia grandiflora</i>	Rubber vine	0.7574	1.00	0.4880	0.7042	7	8
<i>Cynoglossum creticum</i>	Blue hound's tongue	0.5987	1.00	0.2110	0.5300	46	99
<i>Cyperus teneristolon</i>	Cyperus	0.7330	1.00	0.2058	0.5432	42	85
<i>Disa bracteata</i>	African weed-orchid	0.7635	0.57	0.2567	0.4292	64	161
<i>Dittrichia viscosa</i>	False yellowhead	0.6756	1.00	0.2327	0.5514	39	79
<i>Gymnocoronis spilanthoides</i>	Senegal tea plant	0.4856	0.85	0.3575	0.5475	40	83
<i>Hedera helix</i>	English ivy	0.7455	0.42	0.3875	0.4493	61	152
<i>Hymenachne amplexicaulis</i>	Hymenachne, Olive hymenachne	0.6675	0.71	0.6456	0.6830	12	21
<i>Hypericum calycinum</i>	Large flowered St John's wort	0.5533	0.85	0.3388	0.5451	41	84
<i>Hypericum canariense</i>	Canary Island St John's wort	0.5055	0.85	0.2873	0.5106	51	112
<i>Hypericum humifusum</i>	Trailing St John's wort	0.4552	0.85	0.2088	0.4606	59	146
<i>Koeleruteria elegans</i> ssp. <i>formosana</i>	Chinese rain tree	0.5911	1.00	0.1677	0.5048	53	117
<i>Lachenalia reflexa</i>	Yellow Soldier	0.4270	1.00	0.3116	0.5657	37	64
<i>Lantana camara</i>	Lantana	0.6496	0.42	0.6372	0.5776	34	58
<i>Miconia</i> spp.	Miconia	0.8664	1.00	0.3037	0.6140	25	43
<i>Mimosa pigra</i>	Mimosa, giant sensitive plant	0.8180	1.00	0.3506	0.6345	18	34
<i>Onopordum dissectum</i>	Thistle	0.4312	1.00	0.3832	0.6063	28	47
<i>Onopordum nervosum</i>	Cotton thistle	0.5962	0.85	0.4685	0.6229	22	40
<i>Onopordum tauricum</i>	Taurian thistle	0.4682	0.85	0.3464	0.5392	43	89
<i>Opuntia aurantiaca</i>	Tiger pear	0.6516	0.85	0.6580	0.7357	3	3
<i>Parkinsonia aculeata</i>	Parkinsonia	0.6416	1.00	0.5568	0.7288	4	4
<i>Pelargonium alchemilloides</i>	Garden geranium	0.6058	1.00	0.3686	0.6191	24	42
<i>Pereskia aculeata</i>	Leaf cactus	0.7889	1.00	0.7331	0.8452	1	1
<i>Piptochaetium montevidense</i>	Uruguayan rice grass	0.7066	1.00	0.3544	0.6233	21	39
<i>Praxelis clematidea</i>	Praxelis	0.7051	1.00	0.3349	0.6121	27	45
<i>Retama raetam</i>	White weeping broom	0.6883	1.00	0.5053	0.7056	6	7
<i>Rubus alceifolius</i>	Giant bramble	0.6207	1.00	0.1977	0.5252	47	103
<i>Rubus argutus</i>	Florida blackberry	0.8084	1.00	0.4430	0.6851	9	18
<i>Rubus rugosus</i>	Keriberry	0.6752	0.57	0.4284	0.5148	49	108
<i>Sagittaria montevidensis</i>	Arrowhead	0.6835	0.71	0.4546	0.5780	32	56
<i>Sagittaria platyphylla</i>	Delta arrowhead	0.6835	0.71	0.4546	0.5780	32	56
<i>Sagittaria pygmaea</i>	Dwarf arrowhead	0.6835	1.00	0.4546	0.6766	13	22
<i>Salix alba</i>	Willows	0.5995	0.71	0.5951	0.6466	17	31
<i>Salix cinerea</i>	Willows	0.9190	0.85	0.6668	0.7727	2	2
<i>Salix fragilis</i>	Willows	0.5141	0.71	0.6283	0.6549	16	26
<i>Salix humboltiana</i>	Willows	0.5007	0.57	0.3397	0.4441	62	154
<i>Salix matsudana</i>	Willows	0.5980	0.71	0.3534	0.5110	50	111
<i>Salix nigra</i>	Willows	0.5656	0.71	0.5594	0.6225	23	41
<i>Salix purpurea</i>	Willows	0.7995	0.71	0.6302	0.6902	8	15
<i>Salix viminalis</i>	Willows	0.5605	1.00	0.4960	0.6850	10	19
<i>Salix x pendulina</i>	Willows	0.5864	0.57	0.2763	0.4189	65	165
<i>Salix x rubens</i>	Willows	0.6057	0.71	0.6283	0.6659	14	24
<i>Salix x sepulcralis</i> ¹	Willows	0.5920	0.57	0.3534	0.4627	58	145

Noxious Weeds Review; Phase 3a species
Wimmera CMA
Regional score and rank

Scientific name	Common name	Inv. Score	Regional dist.	Impact Score	Regional score	Regional rank	Rank Relative to Phase 1*
<i>Scolymus maculatus</i>	Spotted thistle	0.7940	1.00	0.2136	0.5549	38	75
<i>Senecio glastifolius</i>	Holly leaved senecio	0.5973	1.00	0.3018	0.5807	31	55
<i>Tamarix aphylla</i>	Athel pine, tamarisk	0.6738	0.71	0.3558	0.5215	48	104
<i>Thunbergia laurifolia</i>	Laurel clock vine	0.4405	1.00	0.4150	0.6253	20	38
<i>Tipuana tipu</i>	Rosewood, tipuana tree	0.4541	1.00	0.1403	0.4731	56	139
<i>Trianoptiles solitaria</i>	Subterranean Cape sedge	0.5107	0.85	0.1887	0.4559	60	148

* includes *S. x chrysocoma*



[Return to map](#)

Noxious Weeds Review
Wimmera CMA
Phase 3a Species: Ranked relative to Phase 1 & 2 (highlighted in red)

Scientific name	Common name	Invasiveness Score	Regional Dist	Impact Scores	Final Score	RANK
<i>Pereskia aculeata</i>	Leaf cactus	0.788886	1.00	0.733119	0.845213	1
<i>Salix cinerea</i>	Willows	0.919002	0.85	0.666778	0.772676	2
<i>Opuntia aurantiaca</i>	Tiger pear	0.651556	0.85	0.657976	0.735653	3
<i>Parkinsonia aculeata</i>	Parkinsonia	0.641562	1.00	0.556809	0.728801	4
<i>Eichhornia crassipes</i>	Water Hyacinth	0.879335	1	0.527622	0.720989	5
<i>Acacia nilotica</i>	Prickly acacia	0.574417	1.00	0.534471	0.708234	6
<i>Retama raetam</i>	White weeping broom	0.688328	1.00	0.505316	0.705576	7
<i>Cryptostegia grandiflora</i>	Rubber vine	0.757375	1.00	0.488003	0.704167	8
<i>Orobanche ramosa</i>	Branched Broomrape	0.769900	1	0.519638	0.703385	9
<i>Pennisetum macrourum</i>	African Feather Grass	0.612026	0.85	0.627185	0.696667	10
<i>Acacia erioloba</i>	Giraffe thorn	0.700000	1	0.519638	0.694997	11
<i>Hieracium spp.</i>	Hawkweeds	0.700000	1	0.519638	0.694997	11
<i>Nassella tenuissima</i>	Mexican feather grass	0.700000	1	0.519638	0.694997	11
<i>Acacia karroo</i>	Karoo thorn	0.670000	1	0.519638	0.691397	14
<i>Salix purpurea</i>	Willows	0.799511	0.71	0.630180	0.690242	15
<i>Nassella charruana</i>	Lobed needle grass	0.650000	1	0.519638	0.688997	16
<i>Salvinia molesta</i>	Salvinia	0.587464	1	0.529090	0.686786	17
<i>Rubus argutus</i>	Florida blackberry	0.808417	1.00	0.442982	0.685080	18
<i>Salix viminalis</i>	Willows	0.560486	1.00	0.495981	0.685008	19
<i>Chromolaena odorata</i>	Siam weed, chromolaena	0.789234	1.00	0.446929	0.684988	20
<i>Hymenachne amplexicaulis</i>	Hymenachne, Olive hymenachne	0.667534	0.71	0.645600	0.683040	21
<i>Sagittaria pygmaea</i>	Dwarf arrowhead	0.683469	1.00	0.454599	0.676592	22
<i>Fallopia japonica, Fallopia sachalinensis and hyl</i>	Japanese and Giant knotweed	0.506400	1	0.519638	0.671765	23
<i>Salix x rubens</i>	Willows	0.605670	0.71	0.628311	0.665935	24
<i>Centaurea maculosa .</i>	Spotted knapweed	0.754357	0.85	0.501646	0.660445	25
<i>Salix fragilis</i>	Willows	0.514090	0.71	0.628311	0.654945	26
<i>Parthenium hysterophorus</i>	Parthenium Weed	0.825166	1	0.420087	0.654269	27
<i>Nassella trichotoma</i>	Serrated Tussock	0.761536	0.57	0.675277	0.651939	28
<i>Equisetum spp.</i>	Horsetails	0.726000	0.85	0.519638	0.650117	29
<i>Alternanthera philoxeroides</i>	Alligator Weed	0.527352	0.57	0.719621	0.648670	30
<i>Salix alba</i>	Willows	0.599482	0.71	0.595056	0.646569	31
<i>Prosopis spp.</i>	Mesquite	0.658431	0.85	0.521093	0.642824	32
<i>Iva axillaris</i>	Poverty Weed	0.538501	1	0.453036	0.638320	33
<i>Mimosa pigra</i>	Mimosa, giant sensitive plant	0.818008	1.00	0.350578	0.634484	34
<i>Rubus fruticosus agg.</i>	Blackberry	0.767146	0.42	0.726464	0.633277	35
<i>Cabomba caroliniana</i>	Cabomba	0.620155	0.85	0.481313	0.632954	36
<i>Xanthium spinosum</i>	Noogoora Burr/ Californian Burr	0.619536	0.85	0.500315	0.626521	37
<i>Thunbergia laurifolia</i>	Laurel clock vine	0.440524	1.00	0.415005	0.625266	38
<i>Piptochaetium montevidense</i>	Uruguayan rice grass	0.706617	1.00	0.354400	0.623258	39
<i>Onopordum nervosum</i>	Cotton thistle	0.596175	0.85	0.468505	0.622904	40
<i>Salix nigra</i>	Willows	0.565578	0.71	0.559364	0.622513	41
<i>Pelargonium alchemilloides</i>	Garden geranium	0.605828	1.00	0.368643	0.619139	42
<i>Miconia spp.</i>	Miconia	0.866385	1.00	0.303706	0.614041	43
<i>Bassia scoparia</i>	Kochia	0.610614	1.00	0.356267	0.612783	44
<i>Praxelis clematidea</i>	Praxelis	0.705095	1.00	0.334863	0.612135	45
<i>Convolvulus arvensis</i>	Bindweed	0.779101	0.85	0.430366	0.606497	46
<i>Onopordum dissectum</i>	Thistle	0.431190	1.00	0.383170	0.606318	47
<i>Echium vulgare</i>	Viper's Bugloss	0.655865	0.85	0.446556	0.600775	48
<i>Lagarosiphon major</i>	Lagarosiphon	0.649037	1	0.342517	0.589694	49
<i>Homeria flaccida</i>	Cape Tulip (two-leaf)	0.684162	0.85	0.417379	0.587832	50
<i>Centaurea solstitialis</i>	St. Barnaby's Thistle	0.655091	0.85	0.423400	0.587715	51
<i>Ulex europaeus</i>	Furze/Gorse	0.828248	0.57	0.545087	0.587038	52
<i>Carthamus glaucus</i>	Glaucous star thistle	0.516750	1.00	0.325102	0.584067	53
<i>Anredera cordifolia</i>	Madeira vine	0.766046	0.85	0.358456	0.581661	54
<i>Senecio glastifolius</i>	Holly leaved senecio	0.597307	1.00	0.301771	0.580669	55
<i>Sagittaria montevidensis</i>	Arrowhead	0.683469	0.71	0.454599	0.577992	56
<i>Sagittaria platyphylla</i>	Delta arrowhead	0.683469	0.71	0.454599	0.577992	56
<i>Lantana camara</i>	Lantana	0.649647	0.42	0.637247	0.577616	58
<i>Acroptilon repens</i>	Hardheads/Russian Knapweed	0.514006	0.85	0.434553	0.577030	59
<i>Nassella neesiana</i>	Chilean needle grass	0.686622	0.57	0.543816	0.569332	60
<i>Ambrosia artemisiifolia</i>	Annual ragweed	0.575985	1.00	0.284903	0.568664	61
<i>Cirsium arvense</i>	Californian/Perennial Thistle	0.702729	0.71	0.458673	0.568385	62
<i>Annona glabra</i>	Pond apple	0.694802	1.00	0.258663	0.568228	63
<i>Lachenalia reflexa</i>	Yellow Soldier	0.426976	1.00	0.311622	0.565746	64
<i>Homeria miniata</i>	Cape Tulip (one-leaf)	0.747658	0.71	0.440860	0.563800	65
<i>Rosa rubiginosa</i>	Sweet Briar	0.793721	0.57	0.508953	0.562660	66
<i>Cytisus scoparius</i>	English Broom	0.734874	0.57	0.520938	0.562310	67
<i>Onopordum illyricum</i>	Illyrian Thistle	0.533147	0.85	0.401999	0.561097	68

Noxious Weeds Review

Wimmera CMA

Phase 3a Species: Ranked relative to Phase 1 & 2 (highlighted in red)

Scientific name	Common name	Invasiveness Score	Regional Dist	Impact Scores	Final Score	RANK
<i>Datura ferox</i>	Thorn Apple (common)	0.703633	0.71	0.444751	0.560697	69
<i>Datura stramonium</i>	Thorn Apple (longspine)	0.703600	0.71	0.444751	0.560693	70
<i>Datura inoxia</i>	Thorn Apple (recurved)	0.703600	0.71	0.444751	0.560693	70
<i>Alhagi maurorum</i>	Camelthorn	0.569959	0.85	0.386286	0.556715	72
<i>Cuscuta</i> spp.	Dodder	0.734033	0.71	0.429397	0.555746	73
<i>Hypericum triquetrifolium</i>	Tangled Hypericum	0.602251	0.85	0.377231	0.555520	74
<i>Scolymus maculatus</i>	Spotted thistle	0.794014	1.00	0.213592	0.554893	75
<i>Cannabis sativa</i>	Marijuana	0.565385	1	0.297461	0.554424	76
<i>Onopordum acanthium</i>	Scotch/Heraldic Thistle	0.571238	0.85	0.381627	0.554260	77
<i>Allium triquetrum</i>	Angled Onion	0.614461	0.71	0.448094	0.551868	78
<i>Dittrichia viscosa</i>	False yellowhead	0.675616	1.00	0.232653	0.551360	79
<i>Tribulus terrestris</i>	Caltrop	0.606654	0.85	0.368584	0.551205	80
<i>Festuca gautieri</i>	bearskin fescue	0.491440	0.85	0.387816	0.548150	81
<i>Amsinckia</i> spp.	Amsinckia	0.745464	0.85	0.333240	0.548070	82
<i>Gymnocoronis spilanthoides</i>	Senegal tea plant	0.485586	0.85	0.357542	0.547494	83
<i>Hypericum calycinum</i>	Large flowered St John's wort	0.553290	0.85	0.338782	0.545113	84
<i>Cyperus teneristolon</i>	Cyperus	0.732975	1.00	0.205759	0.543182	85
<i>Salpichroa origanifolia</i>	Pampas Lily-of-the-Valley	0.762638	0.85	0.320066	0.542753	86
<i>Opuntia robusta</i>	Wheel Cactus	0.645158	0.85	0.345016	0.542628	87
<i>Senecio pterophorus</i>	African Daisy	0.676556	0.85	0.337358	0.542107	88
<i>Onopordum tauricum</i>	Taurian thistle	0.468246	0.85	0.346370	0.539157	89
<i>Ambrosia confertiflora</i>	Burr ragweed	0.594088	1.00	0.226697	0.538241	90
<i>Chondrilla juncea</i>	Skeleton Weed	0.742382	0.85	0.315662	0.537856	91
<i>Ailanthus altissima</i>	Tree of Heaven	0.895314	0.57	0.441183	0.536900	92
<i>Cardaria draba</i>	Hoary Cress	0.563497	0.71	0.429138	0.535137	93
<i>Ambrosia psilostachya</i>	Perennial Ragweed	0.489293	0.85	0.364356	0.534755	94
<i>Eragrostis curvula</i>	African Lovegrass	0.715330	0.85	0.314456	0.533935	95
<i>Calluna vulgaris</i>	Heather	0.674172	0.85	0.289081	0.531786	96
<i>Opuntia stricta</i>	Prickly Pear (drooping)	0.552003	0.85	0.345016	0.531449	97
<i>Lavandula stoechas</i>	Topped Lavender	0.682210	0.85	0.316423	0.531062	98
<i>Cynoglossum creticum</i>	Blue hound's tongue	0.598661	1.00	0.210974	0.529985	99
<i>Marrubium vulgare</i>	Horehound	0.771737	0.57	0.451853	0.528046	100
<i>Lycium ferocissimum</i>	Boxthorn	0.674957	0.57	0.470710	0.526993	101
<i>Centaurea nigra</i>	Black Knapweed	0.641607	0.85	0.317275	0.526667	102
<i>Rubus alceifolius</i>	Giant bramble	0.620743	1.00	0.197677	0.525188	103
<i>Tamarix aphylla</i>	Athel pine, tamarisk	0.673811	0.71	0.355786	0.521497	104
<i>Alternanthera pungens</i>	Khaki Weed	0.653479	0.85	0.303604	0.520436	105
<i>Cytisus multiflorus</i>	white Spanish broom	0.517034	0.85	0.330775	0.519278	106
<i>Cestrum parqui</i>	Chilean Cestrum	0.727801	0.71	0.358471	0.515280	107
<i>Rubus rugosus</i>	Keriberry	0.675226	0.57	0.428443	0.514755	108
<i>Conium maculatum</i>	Hemlock	0.665290	0.57	0.446703	0.512388	109
<i>Opuntia vulgaris</i>	Prickly Pear (erect)	0.759228	0.71	0.345016	0.511516	110
<i>Salix matsudana</i>	Willows	0.598025	0.71	0.353359	0.511044	111
<i>Hypericum canariense</i>	Canary Island St John's wort	0.505525	0.85	0.287333	0.510570	112
<i>Sagittaria graminea</i>	Arrowhead	0.586551	0.85	0.298489	0.509540	113
<i>Sida leprosa</i>	Ivy-leaved Sida	0.485639	1	0.234041	0.509339	114
<i>Barleria prionitis</i>	Barleria, porcupine flower	0.700199	1.00	0.150169	0.508118	115
<i>Solanum elaeagnifolium</i>	Silverleaf Nightshade	0.667968	0.71	0.357925	0.507794	116
<i>Koeleruteria elegans ssp.formosana</i>	Chinese rain tree	0.591073	1.00	0.167702	0.504842	117
<i>Calicotome spinosa</i>	Spiny Broom	0.447135	0.85	0.317558	0.503489	118
<i>Crataegus monogyna</i>	Hawthorn	0.704590	0.42	0.506902	0.502816	119
<i>Spartium junceum</i>	Spanish broom	0.341815	0.85	0.33587	0.501105	120
<i>Scolymus hispanicus</i>	Golden Thistle	0.497723	0.71	0.377717	0.498448	121
<i>Hypericum tetrapterum</i>	St. Peter's Wort	0.552896	0.85	0.284303	0.497557	122
<i>Cenchrus longispinus</i>	Spiny Burr Grass/ Gentle Annie	0.402417	0.85	0.313125	0.495640	123
<i>Onopordum acaulon</i>	Stemless Thistle	0.528267	0.85	0.285015	0.495001	124
<i>Cynara cardunculus</i>	Artichoke Thistle	0.662745	0.57	0.413264	0.493358	125
<i>Echium plantagineum</i>	Paterson's Curse	0.665066	0.57	0.412722	0.493332	126
<i>Silybum marianum</i>	Variegated Thistle	0.765111	0.57	0.387726	0.491340	127
<i>Centaurea calcitrapa</i>	Star Thistle	0.408196	0.85	0.303943	0.491192	128
<i>Juncus acutus</i>	Spiny Rush	0.516930	0.57	0.438554	0.490022	129
<i>Carduus nutans</i>	Nodding Thistle	0.390918	0.85	0.302426	0.488269	130
<i>Physalis viscosa</i>	Prairie Ground Cherry	0.727781	0.71	0.309365	0.487778	131
<i>Genista linifolia</i>	Flax Leaved Broom	0.703726	0.57	0.392163	0.486458	132
<i>Nassella hyalina</i>	cane needle grass	0.503576	0.85	0.267807	0.482401	133
<i>Ibicella lutea</i>	Devil's Claw (yellowflower)	0.616016	0.85	0.241384	0.481097	134
<i>Asparagus asparagoides</i>	bridal creeper	0.782848	0.57	0.361907	0.479010	135
<i>Emex australis</i>	Spiny Emex	0.535113	0.85	0.247396	0.474755	136

Noxious Weeds Review

Wimmera CMA

Phase 3a Species: Ranked relative to Phase 1 & 2 (highlighted in red)

Scientific name	Common name	Invasiveness Score	Regional Dist	Impact Scores	Final Score	RANK
<i>Cirsium acarna</i>	Soldier Thistle	0.523968	0.85	0.249563	0.474632	137
<i>Acacia catechu</i>	Cutch tree	0.606058	1.00	0.107969	0.473190	138
<i>Tipuana tipu</i>	Rosewood, tipuana tree	0.454073	1.00	0.140342	0.473080	139
<i>Calystegia silvatica</i>	Greater bindweed	0.317991	0.85	0.259324	0.472380	140
<i>Proboscidea louisianica</i>	Devil's Claw (purpleflower)	0.542172	0.85	0.241384	0.472236	141
<i>Hypericum androsaemum</i>	Tutsan	0.746650	0.71	0.276452	0.471611	142
<i>Solanum rostratum</i>	Buffalo Burr	0.468698	0.85	0.254399	0.470707	143
<i>Carthamus lanatus</i>	Saffron Thistle	0.499430	0.57	0.405518	0.469422	144
<i>Salix x sepulcralis</i>¹	Willows	0.592031	0.57	0.353359	0.462725	145
<i>Hypericum humifusum</i>	Trailing St John's wort	0.455230	0.85	0.208817	0.460565	146
<i>Carduus tenuiflorus</i> / <i>C. pycnocephalus</i>	Slender/Shore Thistle	0.608219	0.57	0.359060	0.456460	147
<i>Trianoptiles solitaria</i>	Subterranean Cape sedge	0.510665	0.85	0.188664	0.455932	148
<i>Pittosporum undulatum</i>	sweet pittosporum	0.793704	0.57	0.315117	0.454110	149
<i>Genista monspessulana</i>	Cape Broom /Montpellier Broom	0.698418	0.42	0.419839	0.453320	150
<i>Xanthium strumarium</i>	Bathurst Burr	0.585163	0.57	0.356250	0.452120	151
<i>Hedera helix</i>	English ivy	0.745474	0.42	0.387495	0.449254	152
<i>Hypericum perforatum</i>	St. John's Wort	0.660601	0.57	0.334271	0.448864	153
<i>Salix humboldtiana</i>	Willows	0.500663	0.57	0.339666	0.444093	154
<i>Leucanthemum vulgare</i>	Ox-eye Daisy	0.610238	0.57	0.333108	0.442169	155
<i>Ambrosia tenuifolia</i>	Lacy ragweed	0.604084	0.85	0.141134	0.440525	156
<i>Chrysanthemoides monilifera</i>	Boneseed/Bitou Bush	0.799614	0.42	0.375091	0.440405	157
<i>Nassella leucotricha</i>	Texas needle grass	0.627929	0.57	0.326146	0.440393	158
<i>Dittrichia graveolens</i>	Stinkwort	0.607585	0.57	0.319717	0.434352	159
<i>Senecio jacobaea</i>	Ragwort	0.776347	0.42	0.363784	0.431281	160
<i>Disa bracteata</i>	African weed-orchid	0.763497	0.57	0.256714	0.429179	161
<i>Vinca major</i>	blue periwinkle	0.703021	0.57	0.289181	0.428704	162
<i>Dipsacus fullonum</i>	Wild Teasel	0.551563	0.57	0.309552	0.421937	163
<i>Allium vineale</i>	Wild Garlic	0.658241	0.57	0.285822	0.421449	164
<i>Salix x pendulina</i>	Willows	0.586438	0.57	0.276310	0.418906	165
<i>Melianthus comosus</i>	Tufted Honeyflower	0.492463	0.42	0.394016	0.414144	166
<i>Solanum linnaeanum</i>	Apple of Sodom	0.356227	0.57	0.325025	0.407161	167
<i>Verbascum thapsus</i>	Great Mullein	0.474171	0.57	0.296038	0.405082	168
<i>Watsonia meriana</i> 'Bulbillifera'	Wild Watsonia	0.402004	0.57	0.307647	0.402923	169
<i>Asystasia gangetica ssp. micrantha</i>	Chinese violet	0.593129	0.57	0.230522	0.394068	170
<i>Foeniculum vulgare</i>	Fennel	0.574220	0.42	0.326980	0.386415	171
<i>Oxalis pes-caprae</i>	Soursob	0.743995	0.28	0.365451	0.383532	172
<i>Asphodelus fistulosus</i>	Onion Weed	0.539790	0.42	0.328848	0.383330	173
<i>Diplotaxis tenuifolia</i>	Sand Rocket/Sand Mustard	0.565974	0.42	0.317803	0.380286	174
<i>Cirsium vulgare</i>	Spear Thistle	0.693549	0.28	0.353660	0.370875	175
<i>Reseda luteola</i>	Wild Mignonette	0.537021	0.57	0.167145	0.340444	176

¹ includes *S. x chrysocoma*



Noxious Weeds Review; Phase 3a species

Wimmera CMA

Present distribution and calculation of potential distribution score

Common name	Scientific name	IPMS		FIS		Regional Estimate		Weight	Estimate based on: regional description, present potential ratio or gut feeling
		# infestations	area of infestation (ha)	# infestations	# infestations	area of infestation			
Cutch tree	<i>Acacia catechu</i>	0	0	0		0.100		1.00	PIRVic estimate
Prickly acacia	<i>Acacia nilotica</i>	0	0	0		0.100		1.00	PIRVic estimate
Annual ragweed	<i>Ambrosia artemisiifolia</i>	0	0	0		1.000		1.00	PIRVic estimate
Burr ragweed	<i>Ambrosia confertiflora</i>	0	0	0		1.000		1.00	PIRVic estimate
Lacy ragweed	<i>Ambrosia tenuifolia</i>	0	0	0		1.000		0.85	PIRVic estimate
Pond apple	<i>Annona glabra</i>	0	0	0		0.100		1.00	PIRVic estimate
Madeira vine	<i>Anredera cordifolia</i>	0	0	0		1.000		0.85	PIRVic estimate
Chinese violet	<i>Asystasia gangetica ssp. Micrantha</i>	0	0	0		0.100		0.85	PIRVic estimate
Barleria, porcupine flower	<i>Barleria prionitis</i>	0	0	0		0.100		1.00	PIRVic estimate
Kochia	<i>Bassia scoparia</i>	0	0	0		1.000		1.00	PIRVic estimate
Cabomba	<i>Cabomba caroliniana</i>	0	0	0		0.100		0.85	PIRVic estimate
Heather	<i>Calluna vulgaris</i>	0	0	0		0.100		0.85	PIRVic estimate
Greater bindweed	<i>Calystegia silvatica</i>	0	0	0		1.000		0.85	PIRVic estimate
Glaucous star thistle	<i>Carthamus glaucus</i>	0	0	0		1.000		1.00	PIRVic estimate
Spotted knapweed	<i>Centaurea maculosa</i>	0	0	0		1.000		0.85	PIRVic estimate
Siam weed, chromolaena	<i>Chromolaena odorata</i>	0	0	0		0.100		1.00	PIRVic estimate
Rubber vine	<i>Cryptostegia grandiflora</i>	0	0	0		0.100		1.00	PIRVic estimate
Blue hound's tongue	<i>Cynoglossum creticum</i>	0	0	0		0.100		1.00	PIRVic estimate
Cyperus	<i>Cyperus teneristolon</i>	0	0	0		0.100		1.00	PIRVic estimate
African weed-orchid	<i>Disa bracteata</i>	4	3	7	10	200.000		0.57	Regional estimate
False yellowhead	<i>Dittrichia viscosa</i>	0	0	0		0.100		1.00	PIRVic estimate
Senegal tea plant	<i>Gymnocoronis spilanthoides</i>	0	0	0		0.100		0.85	PIRVic estimate
English ivy	<i>Hedera helix</i>	2	3	2	2	3.000		0.42	not confirmed recently
Hymenachne, Olive hymenachne	<i>Hymenachne amplexicaulis</i>	0	0	0		0.100		0.71	PIRVic estimate
Large flowered St John's wort	<i>Hypericum calycinum</i>	0	0	0		1.000		0.85	PIRVic estimate
Canary Island St John's wort	<i>Hypericum canariense</i>	0	0	0		1.000		0.85	PIRVic estimate
Trailing St John's wort	<i>Hypericum humifusum</i>	0	0	0		1.000		0.85	PIRVic estimate
Chinese rain tree	<i>Koelreuteria elegans ssp. formosana</i>	0	0	0		0.100		1.00	PIRVic estimate
Yellow Soldier	<i>Lachenalia reflexa</i>	0	0	0		0.100		1.00	PIRVic estimate
Lantana	<i>Lantana camara</i>	0	0	0		0.100		0.42	PIRVic estimate
Miconia	<i>Miconia spp.</i>	0	0	0		1.000		1.00	PIRVic estimate
Mimosa, giant sensitive plant	<i>Mimosa pigra</i>	0	0	0		0.100		1.00	PIRVic estimate
Thistle	<i>Onopordum dissectum</i>	0	0	0		0.000		1.00	PIRVic estimate
Cotton thistle	<i>Onopordum nervosum</i>	0	0	0		1.000		0.85	PIRVic estimate
Taurian thistle	<i>Onopordum tauricum</i>	1	0	2	1	1.000		0.85	Regional estimate
Tiger pear	<i>Opuntia auranziaca</i>	0	0	0		1.000		0.85	PIRVic estimate
Parkinsonia	<i>Parkinsonia aculeata</i>	0	0	0		0.100		1.00	PIRVic estimate
Garden geranium	<i>Pelargonium alchemilloides</i>	0	0	0		0.100		1.00	PIRVic estimate
Leaf cactus	<i>Pereskia aculeata</i>	0	0	0		0.100		1.00	PIRVic estimate
Uruguayan rice grass	<i>Piptochaetium montevidense</i>	0	0	0		0.100		1.00	PIRVic estimate
Praxelis	<i>Praxelis clematidea</i>	0	0	0		0.100		1.00	PIRVic estimate
White weeping broom	<i>Retama raetam</i>	0	0	0		0.100		1.00	PIRVic estimate
Giant bramble	<i>Rubus alceifolius</i>	0	0	0		1.000		1.00	PIRVic estimate
Florida blackberry	<i>Rubus argutus</i>	0	0	0		1.000		1.00	PIRVic estimate
Keriberry	<i>Rubus rugosus</i>	0	0	0		1.000		0.57	PIRVic estimate
Arrowhead	<i>Sagittaria montevidensis</i>	0	0	0		1.000		0.71	PIRVic estimate
Delta arrowhead	<i>Sagittaria platyphylla</i>	0	0	0		1.000		0.71	PIRVic estimate
Dwarf arrowhead	<i>Sagittaria pygmaea</i>	0	0	0		1.000		1.00	PIRVic estimate
Willows	<i>Salix alba</i>	0	0	0		0.100		0.71	PIRVic estimate
Willows	<i>Salix cinerea</i>	0	0	0		0.100		0.85	PIRVic estimate
Willows	<i>Salix fragilis</i>	0	0	0		0.100		0.71	PIRVic estimate
Willows	<i>Salix humboldtiana</i>	0	0	0		0.100		0.57	PIRVic estimate
Willows	<i>Salix matsudana</i>	0	0	0		0.100		0.71	PIRVic estimate
Willows	<i>Salix nigra</i>	0	0	0		0.100		0.71	PIRVic estimate
Willows	<i>Salix purpurea</i>	0	0	0		0.100		0.71	PIRVic estimate
Willows	<i>Salix viminalis</i>	0	0	0		0.100		1.00	PIRVic estimate
Willows	<i>Salix x pendulina</i>	0	0	0		0.100		0.57	PIRVic estimate
Willows	<i>Salix x rubens</i>	0	0	0		0.100		0.71	PIRVic estimate
Willows	<i>Salix x sepulcralis</i> ¹	0	0	0		0.100		0.57	PIRVic estimate
Spotted thistle	<i>Scolymus maculatus</i>	0	0	0		1.000		1.00	PIRVic estimate
Holly leaved senecio	<i>Senecio glastifolius</i>	0	0	0		0.100		1.00	PIRVic estimate
Athel pine, tamarisk	<i>Tamarix aphylla</i>	0	0	0		0.100		0.71	PIRVic estimate
Laurel clock vine	<i>Thunbergia laurifolia</i>	0	0	0		0.100		1.00	PIRVic estimate
Rosewood, tipuana tree	<i>Tipuana tipu</i>	0	0	0		0.100		1.00	PIRVic estimate
Subterranean Cape sedge	<i>Trianoptiles solitaria</i>	0	0	0		0.100		0.85	PIRVic estimate

¹ includes *S. x chrysocoma*



Noxious Weeds Review; Phase 3a species
Wimmera CMA
Potential distribution by landuse and public land

Common name	Scientific name	Potential area* infested by landuse type						Potential total area
		Horticulture	Broadacre cropping	Forestry	Pasture dryland	Pasture irrigated	Public land	
Cutch tree	<i>Acacia catechu</i>	0	0	0	0	0	0	0
Prickly acacia	<i>Acacia nilotica</i>	0	0	0	566,749	5,515	108,600	680,864
Annual ragweed	<i>Ambrosia artemisiifolia</i>	0	1,347,902	0	566,749	5,515	26,390	1,946,556
Burr ragweed	<i>Ambrosia confertiflora</i>	0	1,347,902	0	566,749	5,515	33,840	1,954,006
Lacy ragweed	<i>Ambrosia tenuifolia</i>	0	0	0	566,749	0	26,390	593,139
Pond apple	<i>Annona glabra</i>	0	0	0	0	0	0	0
Madeira vine	<i>Anredera cordifolia</i>	0	0	3,400	0	0	136,300	139,700
Chinese violet	<i>Asystasia gangetica ssp. micrantha</i>	0	0	100	0	0	0	100
Barleria, porcupine flower	<i>Barleria prionitis</i>	0	0	0	0	0	0	0
Kochia	<i>Bassia scoparia</i>	0	1,347,900	0	566,749	0	39,900	1,954,549
Cabomba	<i>Cabomba caroliniana</i>	0	0	0	0	0	71,100	71,100
Heather	<i>Calluna vulgaris</i>	0	0	100	12,500	0	0	12,600
Greater bindweed	<i>Calystegia silvatica</i>	0	0	0	566,749	0	886	567,635
Glaucous star thistle	<i>Carthamus glaucus</i>	0	1,347,902	0	566,749	0	886	1,915,537
Spotted knapweed	<i>Centaurea maculosa</i>	0	0	0	566,749	5,515	44,800	617,064
Siam weed, chromolaena	<i>Chromolaena odorata</i>	0	0	0	0	0	0	0
Rubber vine	<i>Cryptostegia grandiflora</i>	0	0	0	0	0	0	0
Blue hound's tongue	<i>Cynoglossum creticum</i>	0	0	0	566,749	0	149,800	716,549
Cyperus	<i>Cyperus teneristolon</i>	0	1,347,902	0	0	5,515	173,427	1,526,844
African weed-orchid	<i>Disa bracteata</i>	0	0	0	566,749	0	129,500	696,249
False yellowhead	<i>Dittrichia viscosa</i>	0	0	0	566,749	5,515	303,592	875,856
Senegal tea plant	<i>Gymnocoronis spilanthoides</i>	0	0	0	0	5,515	76,500	82,015
English ivy	<i>Hedera helix</i>	0	0	3,405	0	0	208,136	211,541
Hymenachne, Olive hymenachne	<i>Hymenachne amplexicaulis</i>	0	0	0	6,167	0	346	6,513
Large flowered St John's wort	<i>Hypericum calycinum</i>	0	0	0	566,749	5,515	64,101	636,365
Canary Island St John's wort	<i>Hypericum canariense</i>	0	0	0	566,749	5,515	26,390	598,654
Trailing St John's wort	<i>Hypericum humifusum</i>	0	96,313	0	550,266	0	88,100	734,679
Chinese rain tree	<i>Koelreuteria elegans ssp. formosana</i>	0	0	0	0	0	0	0
Yellow Soldier	<i>Lachenalia reflexa</i>	0	0	0	396,650	0	219,868	616,518
Lantana	<i>Lantana camara</i>	0	0	3,400	566,749	5,515	154,700	730,364
Miconia	<i>Miconia spp.</i>	0	0	0	0	0	0	0
Mimosa, giant sensitive plant	<i>Mimosa pigra</i>	0	0	0	0	0	0	0
Thistle	<i>Onopordum dissectum</i>							N/A
Cotton thistle	<i>Onopordum nervosum</i>	0	0	0	566,749	0	281,690	848,439
Taurian thistle	<i>Onopordum tauricum</i>	0	0	0	566,749	5,515	121,003	693,267
Tiger pear	<i>Opuntia aurantiaca</i>	0	0	0	566,749	0	143,942	710,691
Parkinsonia	<i>Parkinsonia aculeata</i>	0	0	0	554,300	0	149,300	703,600
Garden geranium	<i>Pelargonium alchemilloides</i>	0	0	0	566,749	5,515	128,522	700,786
Leaf cactus	<i>Pereskia aculeata</i>	0	0	0	0	0	0	0
Uruguayan rice grass	<i>Piptochaetium montevidense</i>	0	1,344,100	0	566,749	0	29,900	1,940,749
Praxelis	<i>Praxelis clematidea</i>	0	0	0	0	0	0	0
White weeping broom	<i>Retama raetam</i>	0	0	0	566,749	0	71,143	637,892
Giant bramble	<i>Rubus alceifolius</i>	0	0	0	0	0	0	0
Florida blackberry	<i>Rubus argutus</i>	0	0	0	0	0	0	0
Keriberry	<i>Rubus rugosus</i>	0	0	0	0	0	8,256	8,256
Arrowhead	<i>Sagittaria montevidensis</i>	0	0	0	0	5,515	75,100	80,615
Delta arrowhead	<i>Sagittaria platyphylla</i>	0	0	0	0	5,515	75,600	81,115
Dwarf arrowhead	<i>Sagittaria pygmaea</i>	0	0	0	0	0	0	0
Willows	<i>Salix alba</i>	0	0	0	0	0	5,367	5,367
Willows	<i>Salix cinerea</i>	0	0	0	0	0	72,763	72,763
Willows	<i>Salix fragilis</i>	0	0	0	0	0	5,367	5,367
Willows	<i>Salix humboldtiana</i>	0	0	0	0	0	20	20
Willows	<i>Salix matsudana</i>	0	0	0	0	0	5,367	5,367
Willows	<i>Salix nigra</i>	0	0	0	0	0	5,367	5,367
Willows	<i>Salix purpurea</i>	0	0	0	0	0	5,367	5,367
Willows	<i>Salix viminalis</i>	0	0	0	0	0	0	0
Willows	<i>Salix x pendulina</i>	0	0	0	0	0	726	726
Willows	<i>Salix x rubens</i>	0	0	0	0	0	5,367	5,367
Willows	<i>Salix x sepulcralis</i> ¹	0	0	0	0	0	795	795
Spotted thistle	<i>Scolymus maculatus</i>	0	1,347,902	0	560,465	5,515	55,784	1,969,666
Holly leaved senecio	<i>Senecio glastifolius</i>	0	0	0	566,749	5,515	3,103	575,367
Athel pine, tamarisk	<i>Tamarix aphylla</i>	0	0	0	0	0	5,367	5,367
Laurel clock vine	<i>Thunbergia laurifolia</i>	0	0	0	0	0	0	0
Rosewood, tipuana tree	<i>Tipuana tipu</i>	0	0	0	0	0	0	0
Subterranean Cape sedge	<i>Trianoptiles solitaria</i>	0	0	0	0	4,645	10,263	14,908

*unit of measure is hectare
N/A = not available (too few data)
¹ includes *S. x chrysocoma*

Section 3: Victorian Environmental Alert List Plants

Scientific name	Common name	Family
<i>Aegilops cylindrica</i>	Jointed Goatgrass	Poaceae
<i>Anemanthele lessoniana</i>	Wind Grass	Poaceae
<i>Asparagus declinatus</i>	Bridal Veil	Asparagaceae
<i>Baccharis pingraea</i>	Baccharis	Asteraceae
<i>Cabomba caroliniana</i> *	Cabomba*	Cabombaceae
<i>Calluna vulgaris</i> ‡	Heather‡	Ericaceae
<i>Carex buehneri</i>	Leather Leaf Sedge	Cyperaceae
<i>Carthamus glaucus</i>	Glaucous Star Thistle	Asteraceae
<i>Centaurea maculosa</i>	Spotted Knapweed	Asteraceae
<i>Clematis vitalba</i>	Traveller's Joy	Ranunculaceae
<i>Cylindropuntia tunicata</i>	Thistle Cholla	Cactaceae
<i>Cytisus multiflorus</i> ‡ ²	White Spanish Broom‡ ²	Fabaceae
<i>Erica discolor ssp. andreseanthus</i>		Ericaceae
<i>Erica glandulosa</i>		Ericaceae
<i>Euphorbia cyparissias</i>	Cyperus spurge	Euphorbiaceae
<i>Gunnera tinctoria</i>	Chilean Rhubarb	Gunneraceae
<i>Gymnocoronis spilanthoides</i> ‡	Senegal Tea‡	Asteraceae
<i>Heracleum mantegazzianum</i>	Giant Hogweed	Apiaceae
<i>Hypericum canariense</i>	Canary Island St John's Wort	Clusiaceae
<i>Onopordum tauricum</i>	Taurian Thistle	Asteraceae
<i>Ornithogalum umbellatum</i>	Star of Bethlehem	Liliaceae
<i>Peganum harmala</i>	African Rue	Zygophyllaceae
<i>Pereskia aculeata</i> ‡	Leaf Cactus‡	Cactaceae
<i>Piptochaetium montevidense</i> ‡	Uruguayan Ricegrass‡	Poaceae
<i>Piptochaetium uruguense</i>		Poaceae
<i>Retama monosperma</i>	Bridal Broom	Fabaceae
<i>Retama raetam</i> ‡	White Weeping Broom‡	Fabaceae
<i>Senecio madagascariensis</i>	Fireweed	Asteraceae
<i>Striga asiatica</i>	Witchweed	Scrophulariaceae
<i>Tamarix aphylla</i> *	Athel Pine*	Tamaricaceae
<i>Toxicodendron radicans</i>	Poison Ivy	Anacardiaceae
<i>Wachendorfia thyrsiflora</i>	Wachendorfia	Haemodoraceae

* WoNS species

‡ National Alert List species

‡² Assessed in Phase 2

Department of Primary Industries Weed Assessment Record

Scientific Name: *Aegilops cylindrica*

Common Name: jointed goatgrass

Invasiveness

Establishment			
Question	Comments	Rating	Confidence
Germination requirements?	'Will germinate during the fall after dispersal, if moisture and temperature conditions are favourable' (Donald & Ogg 1991). Requires natural seasonal temperatures for germination.	MH	H
Establishment requirements?	Strengthening the wheat canopy can reduce jointed goatgrass seed production 45 to 60% (Anderson et al 2002). Suggests that the weed requires more specific requirements to establish.	ML	H
How much disturbance is required?	'Growers and researchers have observed better emergence and establishment of jointed goatgrass in wheel tracks of combines and tractors than on uncompacted soil....The ability of some jointed goatgrass seed to germinate on the surface of undisturbed soil undoubtedly permits initial establishment in untilled habitats' (Donald & Ogg 1991). Establishes in vigorously growing crops.	MH	H

Growth/Competitive			
Question	Comments	Rating	Confidence
Life form?	Winter annual grass (Morishita 1991).	MH	H
Allelopathic properties?	None described in Donald & Ogg (1991).	L	H
Tolerates herb pressure?	'cattle graze both jointed goatgrass and winter wheat in parts of the Central Great Plains during fall and winter' (Donald & Ogg 1991). No insects targeting the plant. Capable of seed production under moderate herbivory pressure.	MH	H
Normal growth rate?	'The phenology and vegetative shoot growth of jointed goatgrass is similar to winter wheat. The two species germinate together and develop at about the same rate throughout the growing season' (Donald & Ogg 1991). Moderately rapid growth that will equal competitive species of same life form.	MH	H
Stress tolerance to frost, drought, w/logg, sal. etc?	Fire will kill seed. Can emerge under snow from unfrozen soil. (Donald & Ogg 1991). Frost tolerant and drought tolerant. Sensitive to fire and waterlogging.	ML	H

Reproduction			
Question	Comments	Rating	Confidence
Reproductive system	Reproduces only by seed (Morishita 1991). Primarily self-pollinated but low-level of cross-pollination can occur. 'Facultative selfer' (Donald & Ogg 1991). Sexual (self and cross-pollination).	ML	H
Number of propagules produced?	'Plants can produce as many as 3000 seed each' (Donald & Ogg 1991). Above 2000 propagules produced per flowering event.	H	H
Propagule longevity?	'Jointed goatgrass germination ranged between 52 and 75% 1 month after harvest...Most seed germinated or otherwise lost viability in fall with only 5 to 10% remaining after the second winter..Seed in soil persisted from 3 to 5 yr depending upon site' (Donald & Ogg 1991). Seeds survive < 5 years.	L	H

Department of Primary Industries Weed Assessment Record

Scientific Name: *Aegilops cylindrica*

Common Name: jointed goatgrass

Reproduction			
Question	Comments	Rating	Confidence
Reproductive period?	Annual plant. Mature plant produces viable propagules for only 1 year.	L	H
Time to reproductive maturity?	Annual. Reaches maturity and produces viable propagules in under a year.	H	H
Dispersal			
Question	Comments	Rating	Confidence
Number of mechanisms?	'Joint disarticulation aids in local seed dispersal by wind, machinery, and man.... Can be removed by runoff water' (Donald & Ogg 1991). Very light wind dispersed seeds.	H	H
How far do they disperse?	'Joint disarticulation aids in local seed dispersal by wind, machinery, and man' (Donald & Ogg 1991). Due to the accidental dispersal by machinery, very likely that some propagules will disperse > 1km.	H	H
Invasiveness Score			0.6307

Department of Primary Industries Weed Assessment Record

Scientific Name: *Aegilops cylindrica*

Common Name: jointed goatgrass

Impact

Social			
Question	Comments	Rating	Confidence
Restrict human access?	Grows up to 75 cm. Found in many agricultural areas (Morishita 1991). Weed would have a minimal or negligible impact on human access.	L	H
Reduce tourism?	Weed found mainly in agricultural areas. Would not be obvious to the average visitor.	L	H
Injurious to people?	Weed not known to be injurious, toxic or have spines which affect people.	L	H
Damage to cultural sites?	Weed found mainly in agricultural areas. Will have little or negligible effect on aesthetics or structure of cultural site.	L	H
Abiotic			
Question	Comments	Rating	Confidence
Impact flow?	Terrestrial species (Donald & Ogg 1991).	L	H
Impact water quality?	Terrestrial species (Donald & Ogg 1991).	L	H
Increase soil erosion?	Primarily a weed of agriculture and grows with winter wheat. Unlikely to have a further impact on soil erosion.	L	H
Reduce biomass?	Frequently grows with wheat with similar growth rate (Donald & Ogg 1991). Direct replacement of biomass by invader.	ML	M
Change fire regime?	'Jointed goatgrass growing along roadsides can be a late summer fire hazard because plants die in (summer) (Donald & Ogg 1991). If the weed occurs on roadsides or places with little vegetation then may contribute to a minor change in frequency or intensity of fire risk.	ML	H
Community Habitat			
Question	Comments	Rating	Confidence
Impact on composition High value EVC	EVC=Grassy woodland (BCS = E); CMA=Goulburn Broken; Bioreg=Goldfields; CLIMATE potential=H. Usually occurs with winter wheat with similar appearance (Morishita 1991). Occasionally found on roadsides. Weed would usually only affect one of the strata negligibly. Very little displacement of any indigenous species.	L	H
Impact on composition Medium value EVC	Plant unlikely to occur in medium value EVC.	L	H
Impact on composition Low value EVC	Plant unlikely to occur in low value EVC.	L	H

Department of Primary Industries Weed Assessment Record

Scientific Name: *Aegilops cylindrica*

Common Name: jointed goatgrass

Community Habitat			
Question	Comments	Rating	Confidence
Impact on structure?	A weed of agriculture. Usually occurs with winter wheat with similar appearance (Morishita 1991). Occasionally found on roadsides. Weed would usually only affect one of the strata negligibly.	L	H
Effect on threatened flora?	This species is not documented as posing an additional risk to threatened flora.	MH	L
Fauna			
Question	Comments	Rating	Confidence
Effect on threatened fauna?	This species is not documented as posing an additional risk to threatened fauna.	MH	L
Effect on non-threatened fauna?	Weed not documented to have an effect on non-threatened fauna.	L	H
Benefits fauna?	Weed not known to provide benefits or facilitate the establishment of indigenous fauna.	H	H
Injurious to fauna?	Weed not documented to be toxic or have burrs or spines that affect indigenous fauna.	L	H
Pest Animal			
Question	Comments	Rating	Confidence
Food source to pests?	Not known as a food source to pests.	L	H
Provides harbor?	Not known to provide harbour for pest species.	L	H
Agriculture			
Question	Comments	Rating	Confidence
Impact yield?	'In 3 yr of competition studies in Oregon, 54 to 86 jointed goatgrass plants m ⁻² reduced winter wheat yields 25 to 29%'. 'Reported in alfalfa fields and grasslands in Wyoming (Donald & Ogg 1991). Serious impacts on quantity.	H	H
Impact quality?	In winter wheat yields 'lowers harvested grain quality...is a zero tolerance for jointed goatgrass seed in certified winter wheat seed in many states, discovery of even one jointed goatgrass plant in a field prevents the wheat from being certified'. (Donald & Ogg 1991). Serious impacts on quality.	H	H
Affect land value?	"When jointed goatgrass infests wheat fields, it impedes the adoption of conservation practices, increases tillage and herbicide use,...reduces farmland values. These indirect costs exceed \$90 million [US] annually, and total losses exceed \$145 million annually' (DENIX n.d.). Decrease land value < 10%.	M	MH
Change land use?	'When jointed goatgrass infests wheat fields, ... [it] forces farmers to grow less profitable crops' (DENIX n.d.). Downgrading of priority land use to one with less agricultural return.	MH	MH

Department of Primary Industries Weed Assessment Record

Scientific Name: *Aegilops cylindrica*

Common Name: jointed goatgrass

Agriculture			
Question	Comments	Rating	Confidence
Increase harvest costs?	As 'joints are not removed easily by conventional seed cleaning methods, either length graders, such as indent disc and indent cylinder seedcleaners, or gravity tables can separate jointed goatgrass joints from winter wheat seed. Such seed cleaners are slow and costly to operate' (Donald & Ogg 1991). Major increase in time and machinery in harvesting.	H	H
Disease host/vector?	'Is an overwintering host for pests that attack winter wheat. These pests include the Russian wheat aphid (<i>Diuraphis noxia</i> Moedvilko RKO)' and a number of fungal diseases. (See Donald & Ogg 1991 for a complete list). 'The wheat curl mite (<i>Aceria tulipae</i>) which acts as a vector for the wheat streak mosaic virus, is found on jointed goatgrass (Donald & Ogg 1991). Has recently been found in Australia and present on commercial cereal properties in the southern wheat belts of Victoria (DPIF 2005). Host to severe disease.	H	H
Impact Score			0.2808

Present distribution of *Aegilops cylindrica* in Victoria

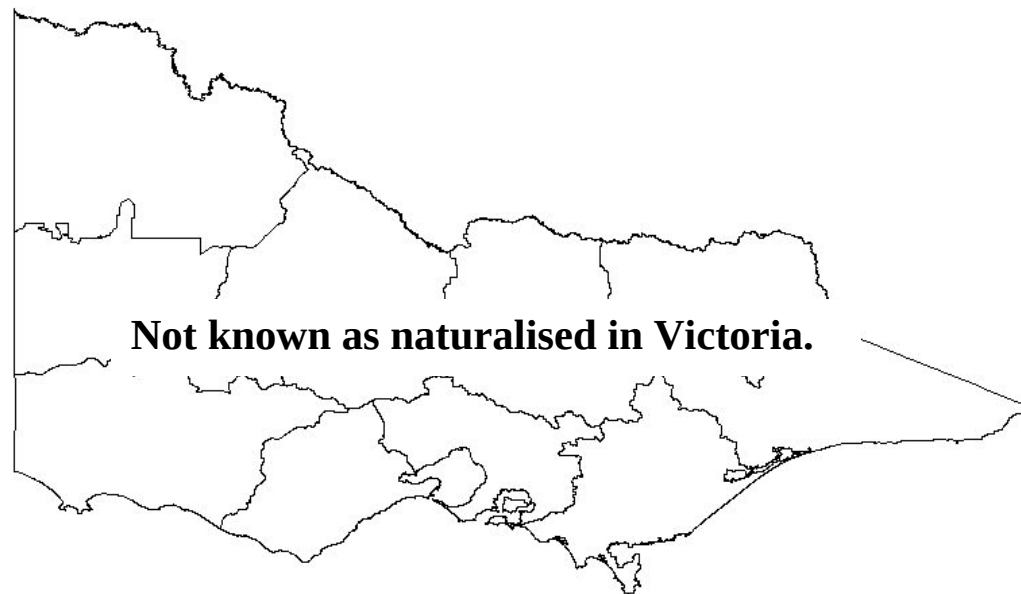
Scientific name: *Aegilops cylindrica* Host

Common name(s): jointed goatgrass

Status:

Habitat:

Generally found in areas of 25 to 55 cm annual rainfall and elevations of 250 to 1200 metres. Most common in winter wheat field or other small grain cereal fields, fence rows, roadsides, waste areas (Morishita 1991). Also infests rangelands surrounding wheat-growing areas (Donald & Ogg 1991).



Potential distribution of *Aegilops cylindrica* in Victoria

Scientific name: *Aegilops cylindrica* Host

Common name(s): jointed goatgrass

Status:

Habitat:

Generally found in areas of 25 to 55 cm annual rainfall and elevations of 250 to 1200 metres. Most common in winter wheat field or other small grain cereal fields, fence rows, roadsides, waste areas (Morishita 1991). Also infests rangelands surrounding wheat-growing areas (Donald & Ogg 1991).

Potential distribution produced from CLIMATE modelling refined by applying suitable landuse and vegetation type overlays with CMA boundaries

MAP OVERLAYS USED.

Land Use:

Broadacre cropping; pasture dryland

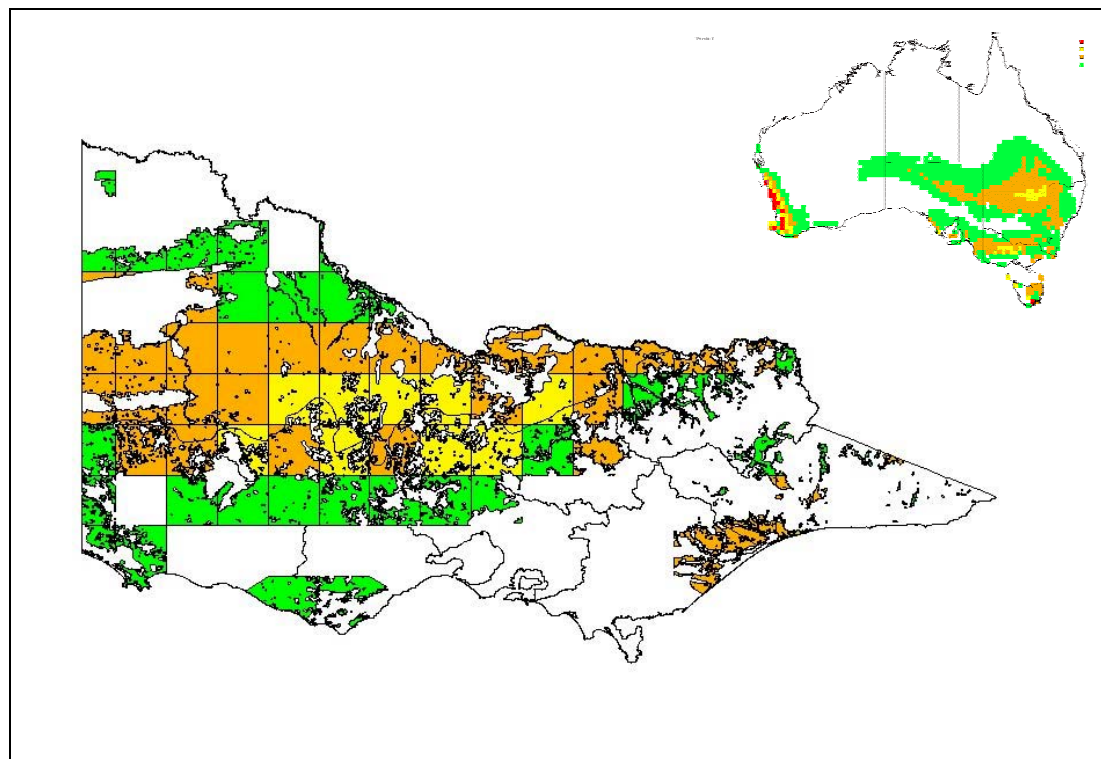
Broad vegetation types

Grassland; plains grassy woodland

Colours indicate possibility of *Aegilops cylindrica* infesting these areas.

Red	= Very high	Yellow	= High
Orange	= Medium	Green	= Likely

In the non-coloured areas the plant is unlikely to establish as the climate, soil or landuse is not presently suitable.



Department of Primary Industries Weed Assessment Record

Scientific Name: *Anemanthele lessoniana*

Common Name: wind grass

Invasiveness

Establishment			
Question	Comments	Rating	Confidence
Germination requirements?	Can be planted in 'moist shade, or in the open in fairly dry conditions'. 'Seed germination conditions 15-20°C' However, light will assist germination (NZERN 2005). Requires natural seasonal temperatures.	MH	M
Establishment requirements?	Grows 'under light shade or in the open' (Stuart 2005). Can establish under moderate canopy.	MH	MH
How much disturbance is required?	Found in light forest, forest margins, scrubs and on bluffs. Occasionally as garden escape on roadsides. Can be grown on banks of streams or margins of ponds. (Jacobs et al 1989). Also found on cliff faces (NZPCN 2005). Edges of streamlets (Veldkamp 1985). Can establish in relatively intact natural ecosystem	MH	H

Growth/Competitive			
Question	Comments	Rating	Confidence
Life form?	Rhizomatous perennial grass (Veldkamp 1985). Life-form – grass.	MH	H
Allelopathic properties?	None described.	L	MH
Tolerates herb pressure?	Tolerant of animal browsing (NZERN 2005). Capable of seed production under moderate herbivory pressure.	MH	M
Normal growth rate?	Growth rate: fast (NZERN 2005). Moderately rapid growth rate that will equal competitive species of same life form.	MH	M
Stress tolerance to frost, drought, w/logg, sal. etc?	Does not like damp soils (NZPCN 2005). Frost hardy to about -7°C. Low to medium waterlogging tolerance; low salt wind tolerance; medium drought tolerance (NZERN 2005). Tolerant to at least 2 and susceptible to at least 2.	ML	M

Reproduction			
Question	Comments	Rating	Confidence
Reproductive system	Seeds and has short, creeping rhizome (Jacobs et al 1989). Capable of both sexual and vegetative reproduction.	H	H
Number of propagules produced?	'Seeds freely and spreads in shaded sites in parks, domains, and Botanic Gardens' (Jacobs et al 1989). Insufficient information to determine number of propagules produced per flowering event. Score medium.	M	L
Propagule longevity?	'Seed viability: excellent' (NZERN 2005). Insufficient information to determine propagule longevity. Score medium.	M	L
Reproductive period?	Insufficient information to determine reproductive period. Score medium.	M	L
Time to reproductive maturity?	Insufficient information to determine time to reproductive maturity. Score medium.	M	L

Department of Primary Industries Weed Assessment Record

Scientific Name: *Anemantbele lessoniana*

Common Name: wind grass

Dispersal			
Question	Comments	Rating	Confidence
Number of mechanisms?	Dispersal: dust seed' (NZERN 2005). Very light wind dispersed seed.	H	M
How far do they disperse?	Insufficient information to determine dispersal distance. Score medium.	M	L
Invasiveness Score			0.6374

Department of Primary Industries Weed Assessment Record

Scientific Name: *Anemanthele lessoniana*

Common Name: wind grass

Impact

Social			
Question	Comments	Rating	Confidence
Restrict human access?	Grows up to 1.5 metres high (Veldkamp 1985). Found in 'forest, forest margins and scrub, also on bluffs. Occasionally found as a garden escape on roadsides' (Jacobs et al 1989). Minimal impact on human access	L	H
Reduce tourism?	'..striking plant with wonderful coloration of the foliage,..late summer is flowering time and the fluffy red heads add to the colourful display' (Stuart 2005). May be noticeable when flowering but not obvious to average visitor.	L	MH
Injurious to people?	Plant not documented to be injurious or toxic in any way.	L	H
Damage to cultural sites?	No evidence that the plant would cause damage to cultural sites.	L	H

Abiotic			
Question	Comments	Rating	Confidence
Impact flow?	Terrestrial species	L	H
Impact water quality?	Terrestrial species	L	H
Increase soil erosion?	Plant has short creeping rhizome (Veldkamp 1985). Naturally sparse distribution (NZPCN 2005). Low probability of large-scale soil movement.	L	MH
Reduce biomass?	'Not especially abundant in the wild' (Jacobs et al 1989). Naturally sparse distribution (NZPCN 2005). A perennial grass that grows up to 150cm. Sometimes found on roadsides and in these instances may slightly increase biomass but in most situations unlikely that biomass would change. Score medium.	M	H
Change fire regime?	With a naturally sparse distribution (NZPCN 2005), plant likely to have a small or negligible effect on fire risk.	L	M

Community Habitat			
Question	Comments	Rating	Confidence
Impact on composition High value EVC	EVC=Herb-rich foothill forest (BCS status = V); CMA=Glenelg Hopkins; Bioreg=Warrnambool Plain; CLIMATE potential=VH.] 'Not especially abundant in the wild' (Jacobs et al 1989). Naturally sparse distribution (NZPCN 2005). Sparse / scattered infestations.	L	H
Impact on composition Medium value EVC	EVC=Valley grassy forest (BCS status = D); CMA=East Gippsland; Bioreg=East Gippsland Lowlands; CLIMATE potential=VH.] 'Not especially abundant in the wild' (Jacobs et al 1989). Naturally sparse distribution (NZPCN 2005). Sparse / scattered infestations.	L	H
Impact on composition Low value EVC	EVC=Lowland forest (BCS status = LC); CMA=East Gippsland; Bioreg=East Gippsland Lowlands; CLIMATE potential=VH.] 'Not especially abundant in the wild' (Jacobs et al 1989). Naturally sparse distribution (NZPCN 2005). Sparse / scattered infestations.	L	H

Department of Primary Industries Weed Assessment Record

Scientific Name: *Anemathele lessoniana*

Common Name: wind grass

Community Habitat			
Question	Comments	Rating	Confidence
Impact on structure?	In its native range in NZ, found in 'forest, forest margins and scrub, also on bluffs. Occasionally found as a garden escape on roadsides'. 'Not especially abundant in the wild'(Jacobs et al 1989). Naturally sparse distribution (NZPCN 2005). Minor effect on less than 20% of the floral strata present.	L	H
Effect on threatened flora?	This species is not documented as posing an additional risk to threatened flora.	MH	L
Fauna			
Question	Comments	Rating	Confidence
Effect on threatened fauna?	This species is not documented as posing an additional risk to threatened fauna.	MH	L
Effect on non-threatened fauna?	This species is not documented as having an effect on non-threatened fauna species.	L	M
Benefits fauna?	This species is not documented as providing benefits or facilitating the establishment of indigenous fauna.	H	M
Injurious to fauna?	This species is not documented as being toxic or affecting indigenous fauna in any way.	L	M
Pest Animal			
Question	Comments	Rating	Confidence
Food source to pests?	This species is not documented as providing a food source to assist in the success of pest animals.	L	M
Provides harbor?	This species is not documented as providing harbour for serious pests.	L	M
Agriculture			
Question	Comments	Rating	Confidence
Impact yield?	Not a weed of cropping.	L	H
Impact quality?	Not a weed of agriculture.	L	H
Affect land value?	Weed not known to affect land value.	L	H
Change land use?	Weed not documented to cause a change in priority of land use.	L	H
Increase harvest costs?	Not a weed of cropping.	L	H
Disease host/vector?	Weed not documented as an alternative host or vector for disease of agriculture.	L	H

Department of Primary Industries Weed Assessment Record

Scientific Name: *Anemantele lessoniana*

Common Name: wind grass

Impact Score

0.1026

Present distribution of *Anemanthele lessoniana* in Victoria

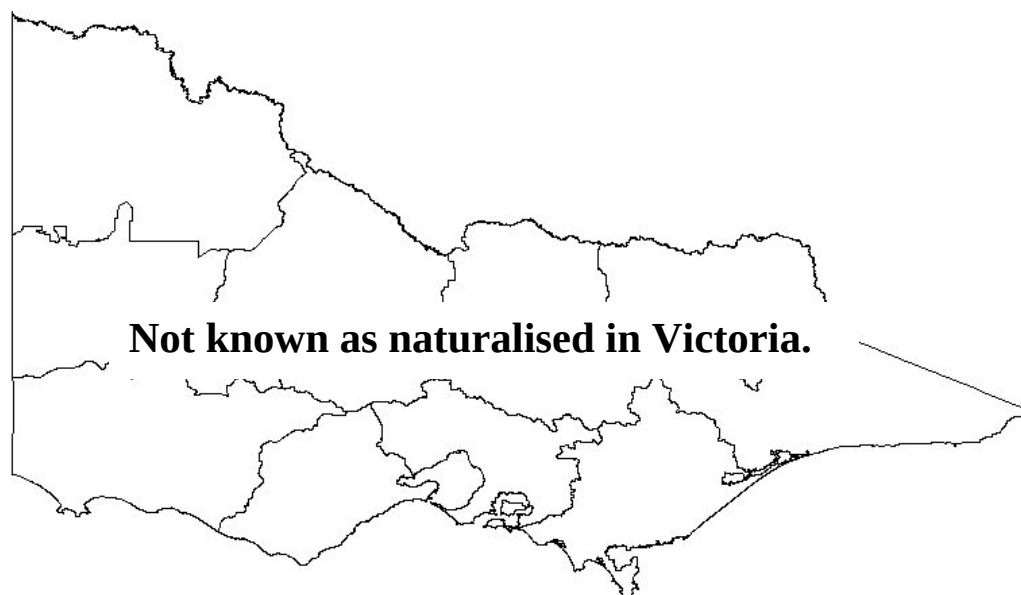
Scientific name: *Anemanthele lessoniana* (Steud.) Veldkamp

Common name(s): New Zealand wind grass, rainbow grass

Status:

Habitat:

Native to New Zealand. Sea level to montane in forest, forest margins and scrub, also on bluffs. Occasionally found as a garden escape on roadsides. Can grow in coastal areas. Cliff faces and associated talus. Has been found on banks of streams (Edgar & Connor 2000).



Potential distribution of *Anemanthele lessoniana* in Victoria

Scientific name: *Anemanthele lessoniana* (Steud.) Veldkamp

Common name(s): New Zealand wind grass, rainbow grass

Status:

Habitat:

Native to New Zealand. Sea level to montane in forest, forest margins and scrub, also on bluffs. Occasionally found as a garden escape on roadsides. Can grow in coastal areas. Cliff faces and associated talus. Has been found on banks of streams (Edgar & Connor 2000).

Potential distribution produced from CLIMATE modelling refined by applying suitable landuse and vegetation type overlays with CMA boundaries

MAP OVERLAYS USED.

Land Use:

Forest private plantation; forest public plantation; pasture dryland; pasture irrigation

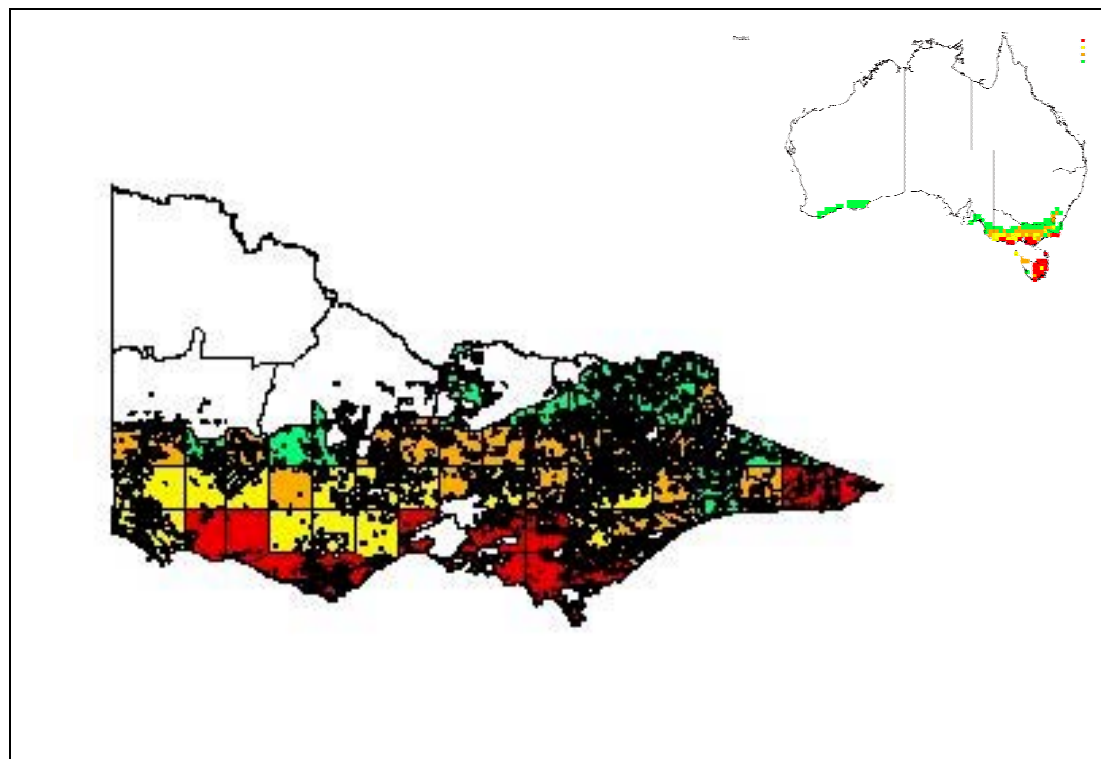
Broad vegetation types

Coastal scrubs and grassland; coastal grassy woodland; lowland forest; box ironbark forest; inland slopes woodland; sedge-rich woodland; dry foothill forest; moist foothill forest; montane dry woodland; montane moist forest; grassland; plains grassy woodland; valley grassy forest; herb-rich woodland; montane grassy woodland; riverine grassy woodland; riparian forest; rainshadow woodland

Colours indicate possibility of *Anemanthele lessoniana* infesting these areas.

 Red	= Very high	 Yellow	= High
 Orange	= Medium	 Green	= Likely

In the non-coloured areas the plant is unlikely to establish as the climate, soil or landuse is not presently suitable.



Department of Primary Industries Weed Assessment Record

Scientific Name: *Asparagus declinatus*

Common Name: bridal veil

Invasiveness

Establishment			
Question	Comments	Rating	Confidence
Germination requirements?	'Autumn rains trigger the growth of shoots from the rhizome' (Bass & Lawrie 2003). Requires natural seasonal conditions for germination.	MH	MH
Establishment requirements?	In Australia, has been found in low open forest (Bass & Lawrie 2003). Suggests that can establish under moderate canopy.	MH	MH
How much disturbance is required?	In South Africa, 'found in fynbos or coastal scrub, predominantly on rocky outcrops' (Obermeyer 1984 cited in Bass & Lawrie 2003). 'Potential to inhabit a range of vegetation communities including closed forests and open woodlands' (Lethbridge 2005). In Australia, has been found in low open forest (Bass & Lawrie 2003). Can establish in minor disturbed natural ecosystems.	MH	MH

Growth/Competitive			
Question	Comments	Rating	Confidence
Life form?	Climbing perennial. Geophyte (Bass & Lawrie 2003).	ML	MH
Allelopathic properties?	None described.	L	MH
Tolerates herb pressure?	'Introduced as stock feed' After animals removed, weed flourished. (Bass & Lawrie 2003). 'Grazing can provide some control' for <i>A. asparagoides</i> (Weeds CRC 2003). Reproduction strongly inhibited by herbivory but still capable of vegetative propagule production.	ML	MH
Normal growth rate?	Insufficient information to determine rate of growth.	M	L
Stress tolerance to frost, drought, w/logg, sal. etc?	Relies on branching rhizomes during dry periods (Bass & Lawrie 2003). <i>A. asparagoides</i> 'is frost tolerant and its root system allows it to survive summer droughts' (Weeds CRC 2003). Susceptible to fire. Susceptible to waterlogging. Found along coast – likely to be salt tolerant.	MH	MH

Reproduction			
Question	Comments	Rating	Confidence
Reproductive system	Field and glasshouse observations show occasional resprouting from detached tubers (Bass 2002). Capable of both sexual and vegetative reproduction.	H	MH
Number of propagules produced?	An average of 5-8 seeds per fruit (Bass & Lawrie 2003). In 2002, one site recorded 3837 seeds/m2. Possible that one plant can produce above 2000 propagules.	H	MH
Propagule longevity?	For <i>A. asparagoides</i> 'buried seed .. rots within two years, while seed on the soil surface may be viable for at least three years' (Weeds CRC 2003). Studies currently being done to determine propagule longevity for <i>A. declinatus</i> .	M	L
Reproductive period?	Insufficient information to determine reproductive period for <i>A. declinatus</i> .	M	L

Department of Primary Industries Weed Assessment Record

Scientific Name: *Asparagus declinatus*

Common Name: bridal veil

Reproduction			
Question	Comments	Rating	Confidence
Time to reproductive maturity?	A. asparagoides 'take at least three years to reach flowering size' (Weeds CRC 2003). A. declinatus known to have similar ecology and morphology. 2-5 years.	ML	L
Dispersal			
Question	Comments	Rating	Confidence
Number of mechanisms?	A. declinatus seeds are likely to be dispersed by the grey currawong, Australian raven, brush wattlebird and red wattlebird' (Bass & Lawrie 2003). Also likely to be important ground foraging mammal component like bush rats (Bass 2002). Bird dispersed and eaten by highly mobile animals.	H	MH
How far do they disperse?	'Dispersal distances are likely to be greater than for A. asparagoides'(Lawrie 2002). 'Common dispersal distances for ground and arboreal mammals is 0 – 100m' (Bass & Lawrie 2003). The larger birds likely to disperse seeds further. Many propagules will reach 200 – 1000m.	MH	MH
Invasiveness Score			0.6793

Department of Primary Industries Weed Assessment Record

Scientific Name: *Asparagus declinatus*

Common Name: bridal veil

Impact

Social			
Question	Comments	Rating	Confidence
Restrict human access?	Climbing perennial that grows up to 1m with recurved and zig-zag branches. Can form dense mats. (Bass & Lawrie 2003). Unlikely to restrict human access.	L	MH
Reduce tourism?	Weed not documented to impact upon tourism.	L	MH
Injurious to people?	Weed not known to be injurious to people.		M
Damage to cultural sites?	Plant not documented to cause damage to cultural sites.	L	MH
Abiotic			
Question	Comments	Rating	Confidence
Impact flow?	Terrestrial species (Marchant et al 1987).	L	MH
Impact water quality?	Terrestrial species (Marchant et al 1987).	L	MH
Increase soil erosion?	Tuberous roots (Marchant et al 1987). 'Large plants may have 20-50 tubers and often become entangled with neighbouring plants to produce tuber masses of a square metre consisting of hundreds of tubers' (Bass 2002). Plants die back during summer (Bass & Lawrie 2003). May have some soil erosion but low probability of large scale soil movement.	L	MH
Reduce biomass?	Root systems form dense mats and can account for up to 85% of mass in mature plants. Where established, there is a decline in litter, bare ground and other ground cover' (Bass & Lawrie 2003). In bare areas biomass may increase and in other areas may be a direct replacement of biomass.	ML	MH
Change fire regime?	Plant dies back during summer. One study showed that litter in infested areas reduced from 67% to 7%. (Bass & Lawrie 2003). Plant can also establish on bare ground. May cause a minor change to intensity of fire.	ML	MH
Community Habitat			
Question	Comments	Rating	Confidence
Impact on composition High value EVC	EVC=Parilla Mallee (BCS = E); CMA=Mallee; Bioreg=Lowan Mallee; CLIMATE potential=VH. 'A. declinatus reduces biodiversity between 8% and 71%, reduces the recruitment of woody species by 69% and may alter successional pathways' 'Correlates with woody canopies > 2 m high' 'Where established, there is a decline in litter, bare ground and other ground cover'. ..'approximately 69% less woody plant seedlings in 90 infested quadrats' (Bass & Lawrie 2003). Potential to cause major displacement of dominant species within the lower and middle strata.	MH	MH

Department of Primary Industries Weed Assessment Record

Scientific Name: *Asparagus declinatus*

Common Name: bridal veil

Community Habitat			
Question	Comments	Rating	Confidence
Impact on composition Medium value EVC	EVC=Grassy dry forest (BCS = D); CMA=Wimmera; Bioreg=Greater Grampians; CLIMATE potential=VH. 'A. declinatus reduces biodiversity between 8% and 71%; reduces the recruitment of woody species by 69% and may alter successional pathways' 'Correlates with woody canopies > 2 m high' Where established, there is a decline in litter, bare ground and other ground cover'. ..'approximately 69% less woody plant seedlings in 90 infested quadrats' (Bass & Lawrie 2003). Potential to cause major displacement of dominant species within the lower and middle strata.	MH	MH
Impact on composition Low value EVC	EVC=Heathy woodland (BCS = LC); CMA=Glenelg Hopkins; Bioreg=Glenelg Plain; CLIMATE potential=VH. 'A. declinatus reduces biodiversity between 8% and 71%; reduces the recruitment of woody species by 69% and may alter successional pathways' 'Correlates with woody canopies > 2 m high' Where established, there is a decline in litter, bare ground and other ground cover'. ..'approximately 69% less woody plant seedlings in 90 infested quadrats' (Bass & Lawrie 2003). Potential to cause major displacement of dominant species within the lower and middle strata.	MH	MH
Impact on structure?	'A. declinatus reduces biodiversity between 8% and 71%, reduces the recruitment of woody species by 69% and may alter successional pathways' 'Correlates with woody canopies > 2 m high' Where established, there is a decline in litter, bare ground and other ground cover'. ..'approximately 69% less woody plant seedlings in 90 infested quadrats' (Bass & Lawrie 2003). A. asparagoides 'is a major threat to most low shrubs and groundcover plants in mallee, dry sclerophyll forest and heath vegetation' (Weeds CRC 2003). Major effect on lower and middle strata.	MH	MH
Effect on threatened flora?	'Rare native plants such as the rice flower Pimelea spicata are threatened with extinction by bridal creeper' (Weeds CRC 2003). Possible that bridal veil may also have same effect.	MH	L
Fauna			
Question	Comments	Rating	Confidence
Effect on threatened fauna?	Plant not documented as posing an additional risk to threatened fauna.	MH	L
Effect on non-threatened fauna?	Plant not documented as having an effect on non-threatened fauna species.	L	MH
Benefits fauna?	'Preliminary seed dispersal observations of A.declinatus in South Australia indicate the main dispersers are medium to large gregarious birds such as Strepera versicolor (Grey Currawong), Gymnorhina tibicen (Australian Magpie) and Anthochaera carunculata (Red Wattlebird). Arboreal mammals, such as Trichosurus vulpecula (Brush-tailed Possum) and Pseudocheirus peregrinus(Common Ringtail Possum) and small rodents' (Bass & Lawrie 2003). Plant may provide some assistance in food to desirable species.	MH	MH
Injurious to fauna?	Plant not documented as being injurious to fauna.	L	MH
Pest Animal			
Question	Comments	Rating	Confidence

Department of Primary Industries Weed Assessment Record

Scientific Name: *Asparagus declinatus*

Common Name: bridal veil

Pest Animal			
Question	Comments	Rating	Confidence
Food source to pests?	'..but favoured by ground foraging birds like blackbirds, currawongs. Also likely to be important ground foraging mammal component like bush rats (Bass 2002). For A. asparagoides, 'rabbits and foxes also eat fruits and disperse seeds' (Weeds CRC 2003). Possible that A. declinatus will supply food to serious pests.	MH	MH
Provides harbor?	Not documented to provide harbour to pest species.	L	MH
Agriculture			
Question	Comments	Rating	Confidence
Impact yield?	Has 'similar morphology, ecology and impacts as A. asparagoides (Lawrie 200). A. asparagoides 'causes losses to primary industries by shading citrus and avocado trees and interfering with picking' 'Grows well in citrus orchards and pine plantations'(Weeds CRC 2003). Impact on agriculture not yet known.	M	L
Impact quality?	Not documented to impact upon quality.	L	MH
Affect land value?	'Appears to spread more rapidly and better withstand control activities than A. asparagoides'. Possible that land value may be affected if spreads to agricultural areas. Not documented at this stage.	M	L
Change land use?	A. declinatus not documented to change priority of land use but if it spreads to agricultural areas has the potential to.	M	L
Increase harvest costs?	A. declinatus not documented to increase harvest costs but if spreads to agricultural land may involve more time and labour.	M	L
Disease host/vector?	Not documented as a host or vector for disease of agriculture.	L	MH
Impact Score			0.3533

Present distribution of *Asparagus declinatus* in Victoria

Scientific name: *Asparagus declinatus* L

Common name(s): Bridal veil

Status:

Habitat:

Native to South Africa. In South Africa, 'found in fynbos or coastal scrub, predominantly on rocky outcrops' (Obermeyer 1984 cited in Bass & Lawrie 2003). 'Potential to inhabit a range of vegetation communities including closed forests and open woodlands' (Lethbridge 2005). In Australia, has been found in low open forest (Bass & Lawrie 2003).



Potential distribution of *Asparagus declinatus* in Victoria

Scientific name: *Asparagus declinatus* L

Common name(s): Bridal veil

Status:

Habitat:

Native to South Africa. In South Africa, 'found in fynbos or coastal scrub, predominantly on rocky outcrops' (Obermeyer 1984 cited in Bass & Lawrie 2003). 'Potential to inhabit a range of vegetation communities including closed forests and open woodlands' (Lethbridge 2005). In Australia, has been found in low open forest (Bass & Lawrie 2003).

Potential distribution produced from CLIMATE modelling refined by applying suitable landuse and vegetation type overlays with CMA boundaries

MAP OVERLAYS USED.

Land Use:

Forest private plantation; forest public plantation; horticulture.

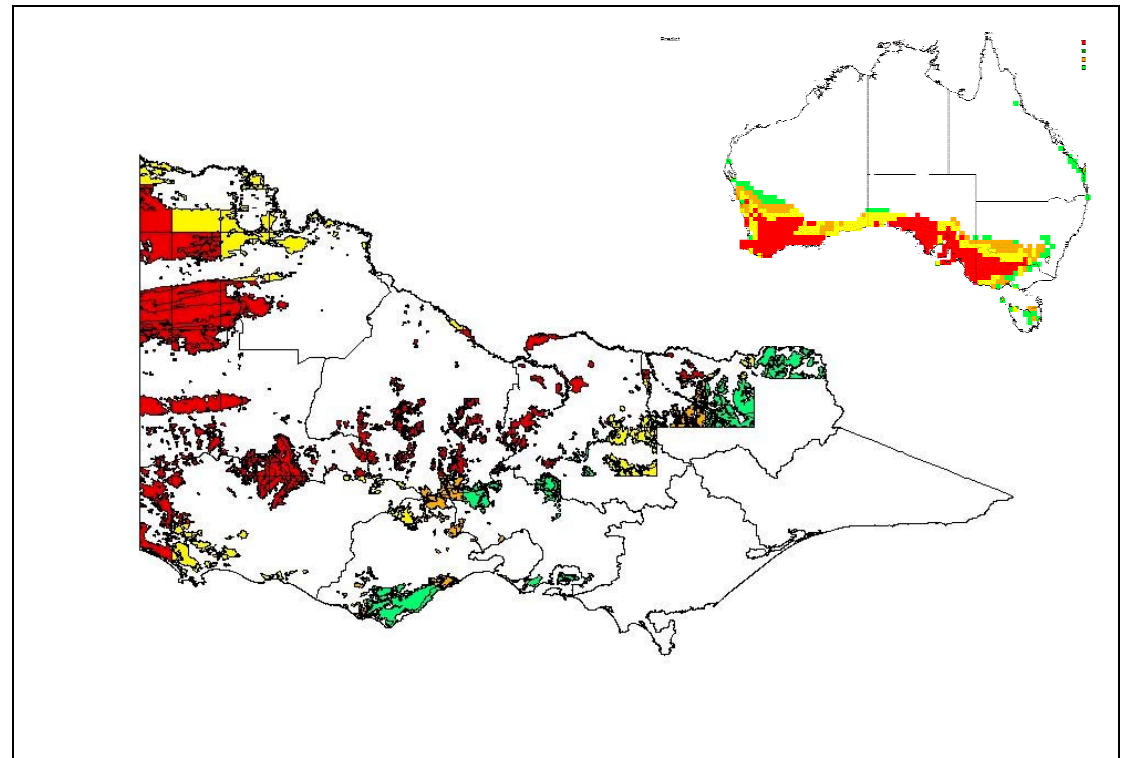
Broad vegetation types

Coastal scrubs and grassland; coastal grassy woodland; heathy woodland; lowland forest; heath; box ironbark forest; inland slopes woodland; sedge-rich woodland; dry foothill forest; moist foothill forest; montane dry woodland; sub-alpine woodland; grassland; plains grassy woodland; valley grassy forest; herb-rich woodland; sub-alpine grassy woodland; montane grassy woodland; riverine grassy woodland; riparian forest; rainshadow woodland; mallee; mallee heath; boinka-raak; mallee woodland; Wimmera/mallee woodland

Colours indicate possibility of *Asparagus declinatus* infesting these areas.

 Red	= Very high	 Yellow	= High
 Orange	= Medium	 Green	= Likely

In the non-coloured areas the plant is unlikely to establish as the climate, soil or landuse is not presently suitable.



Department of Primary Industries Weed Assessment Record

Scientific Name: *Baccharis pingraea*

Common Name: chilquilla

Invasiveness

Establishment			
Question	Comments	Rating	Confidence
Germination requirements?	B. halimifolia has 'no dormancy requirement for germination' (Nesom 2001). Mature seed can germinate immediately. Germination is stimulated by exposure to light (Parsons & Cuthbertson 2001). B. pilularis seeds' germinate after autumn or winter rains. Assume that B. pingraea requires natural seasonal conditions for germination.	MH	L
Establishment requirements?	B. halimifolia 'seed production is at a maximum in the open but, once the shrub is established, it produces a small quantity of viable seed even when densely shaded' (Parsons & Cuthbertson 2001). B. pilularis is a shade intolerant species (USDA 2003). Assume that B. Pingraea requires more specific requirements to establish.	ML	L
How much disturbance is required?	'B. pingraea is a weed of agriculture/pastures, natural areas, and roadsides. Baccharis spp. can become persistent weeds in flood plains, old fields, or similar habitats' (Cunningham et al 2004). Establishes in highly disturbed natural ecosystems.	ML	MH

Growth/Competitive			
Question	Comments	Rating	Confidence
Life form?	Perennial shrub (Cunningham et al 2004). Life form – other,	L	MH
Allelopathic properties?	None described.	L	M
Tolerates herb pressure?	B. halimifolia is suspected of poisoning cattle and considered toxic to sheep (Parsons & Cuthbertson 2001). In California, 'the effects of grazing .. by domestic animals probably is a factor in reducing the rate of baccharis [pilularis] spread' (McBride and Heady 1968). B. pingraea is not under a biocontrol program in Aust or NZ and assume that capable of flowering under moderate herbivory pressure.	MH	L
Normal growth rate?	B. halimifolia is a 'fast-growing plant' (Nesom 2001). 'Some species [of Baccharis] are characterised by rapid growth' (USACE 2002). Assume that B. pingraea has a moderately rapid growth rate.	MH	L
Stress tolerance to frost, drought, w/ogg, sal. etc?	Many species of Baccharis are salt tolerant (Mabberley 1997). B. halimifolia has 'wide adaptability to soil nutrients and salinity; survival in extreme wet soil conditions, and ability to resprout after fire' (Nesom 2001). B. pingraea found in Pietermaritzburg, South Africa, where severe frosts are common (L. Henderson 2006, pers. comm.20 April). May be susceptible to drought.	MH	MH

Reproduction			
Question	Comments	Rating	Confidence
Reproductive system	Dioecious shrub (Cunningham et al 2004). Reproduces sexually – cross-pollination.	L	MH
Number of propagules produced?	B. halimifolia has 'prolific seed production' (Nesom 2001). B. halimifolia plants 'produce up to one million seeds in a single season' (Parsons & Cuthbertson 2001). Images of B. pingraea show much smaller plant. Insufficient information on propagules produced per flowering event.	M	L

Department of Primary Industries Weed Assessment Record

Scientific Name: *Baccharis pingraea*

Common Name: chilquilla

Reproduction			
Question	Comments	Rating	Confidence
Propagule longevity?	B. halimifolia has 'high seed germination percentage (Nesom 2001). 'Loss of viability of seed after 14 months or less' [for B. halimifolia] (Miller & Skaradek 2002). Assume that B. pingraea seeds survive less than 5 years.	L	L
Reproductive period?	Baccharis spp. 'can form dense thickets in open areas' (Cunningham et al 2004). Baccharis pilularis 'live 10 to 15 years' (USDA 2003). Assume that B. pingraea can produce viable propagules for greater than 10 years.	H	L
Time to reproductive maturity?	B. halimifolia plants 'as young as 3 years may produce viable seed' (Nesom 2001). Perennial shrub. Assume that B. pingraea will reach reproductive maturity between 2-5 years.	ML	L
Dispersal			
Question	Comments	Rating	Confidence
Number of mechanisms?	B. halimifolia spreads by wind and water (Parsons & Cuthbertson 2001). B. pilularis 'achenes are dispersed primarily by wind, but also by mammals'(USDA 2003). Assume that B. pingraea propagules are also spread by wind, water and mammals.	MH	L
How far do they disperse?	'Fluffy white seeds' (Cunningham et al 2004). B. halimifolia has 'long-range seed dispersal' (Nesom 2001). Insufficient information to determine dispersal distance of B. pingraea seed.	M	L
Invasiveness Score			0.4379

Department of Primary Industries Weed Assessment Record

Scientific Name: *Baccharis pingraea*

Common Name: chilquilla

Impact

Social			
Question	Comments	Rating	Confidence
Restrict human access?	<i>B. halimifolia</i> 'forms dense impenetrable thickets .. restricting movement of stock and machinery' (Parsons & Cuthbertson 2001). <i>B. pingraea</i> grows up to 1m high (L. Henderson 2006, pers. comm.20 April). Although not as high and as branched as <i>B. halimifolia</i> , <i>B. pingraea</i> may still have a low nuisance value.	ML	L
Reduce tourism?	In California, <i>Baccharis pilularis</i> is growing in grasslands. 'The open grasslands are used frequently by recreationists, while the dense <i>baccharis</i> stands are not because of the difficulty in penetrating them...unsuited for hiking, extended views, and horseback riding' (McBride & Heady H 1968). <i>B. pingraea</i> may have minor effect on recreational uses.	ML	L
Injurious to people?	<i>Baccharis</i> 'pollen and other airborne plant parts are believed to be allergenic' (Miller & Skaradek 2002). Was referring specifically to <i>B. halimifolia</i> but may also be the case for <i>B. pingraea</i> . Plant may cause some physiological issues at certain times of the year.	ML	MH
Damage to cultural sites?	Species unlikely to cause damage to indigenous or European cultural sites.	L	MH
Abiotic			
Question	Comments	Rating	Confidence
Impact flow?	Terrestrial species	L	MH
Impact water quality?	Terrestrial species	L	MH
Increase soil erosion?	'Some species [of <i>Baccharis</i>] characterized by rapid growth and deep fibrous roots have been planted for erosion control' (USACE 2002). Plant unlikely to increase soil erosion.	L	MH
Reduce biomass?	<i>Baccharis</i> spp. found in sandy flood plains, salt marshes, low ground, fencerows, open woods, pastures and roadsides. Can form dense thickets (USACE 2002). In areas where it is found, may slightly increase biomass.	L	MH
Change fire regime?	Forms in areas with low vegetation. May be a shift from surface to crown fire regime although no documented evidence of this. Small or negligible effect on fire risk.	L	L
Community Habitat			
Question	Comments	Rating	Confidence
Impact on composition High value EVC	EVC=Heathy woodland (BCS status = V); CMA=Goulburn Broken; Bioreg=Goldfields; CLIMATE potential=VH] ' <i>Baccharis</i> spp. can become persistent weeds in flood plains, old fields, or similar habitats .. they can form dense thickets' (USACE 2002). Minor displacement of some dominant species within the lower strata.	ML	MH
Impact on composition Medium value EVC	EVC=Heathy herb-rich woodland (BCS status = D); CMA=Wimmera; Bioreg=Wimmera; CLIMATE potential=VH] ' <i>Baccharis</i> spp. can become persistent weeds in flood plains, old fields, or similar habitats .. they can form dense thickets' (USACE 2002). Minor displacement of some dominant species within the lower strata.	ML	MH

Department of Primary Industries Weed Assessment Record

Scientific Name: *Baccharis pingraea*

Common Name: chilquilla

Community Habitat			
Question	Comments	Rating	Confidence
Impact on composition Low value EVC	EVC=Heathy woodland (BCS status = V.); CMA=Wimmera; Bioreg=Wimmera; CLIMATE potential=VHJ 'Baccharis spp. can become persistent weeds in flood plains, old fields, or similar habitats .. they can form dense thickets' (USACE 2002). Minor displacement of some dominant species within the lower strata.	ML	MH
Impact on structure?	'Baccharis spp. can become persistent weeds in flood plains, old fields, or similar habitats .. they can form dense thickets' (USACE 2002). May have minor effect on 20-60% of the lower strata.	ML	MH
Effect on threatened flora?	This species is not documented as posing an additional risk to threatened flora.	MH	L
Fauna			
Question	Comments	Rating	Confidence
Effect on threatened fauna?	This species is not documented as posing an additional risk to threatened fauna.	MH	L
Effect on non-threatened fauna?	Not documented to have an effect on non-threatened fauna.	L	M
Benefits fauna?	B. halimifolia 'apparently has little or no value as a good food source for game animals' . B. halimifolia 'provides cover and nesting habitat for various species of birds' (Nesom 2001). 'Small birds frequently nest in the openly branched, brittle stems'[of B. halimifolia] (Miller & Skaradek 2002). Possible that B. pingraea provides some assistance in shelter to desirable species.	MH	MH
Injurious to fauna?	'Baccharis sp. contain toxic compounds' (Cunningham et al 2004). 'Certain Baccharis species are acutely toxic to cattle, horses and sheep' (IOM 2005). Possible that B. pingraea is toxic to indigenous fauna.	MH	L
Pest Animal			
Question	Comments	Rating	Confidence
Food source to pests?	This species is not documented as providing a food source for pest animals.	L	M
Provides harbor?	This species is not documented as providing harbour for pest species.	L	M
Agriculture			
Question	Comments	Rating	Confidence
Impact yield?	B. halimifolia 'forms dense impenetrable thickets .. restricting movement of stock and machinery and reducing agricultural and pastoral potential of the infested area' (Parsons & Cuthbertson 2001). Possible that B. pingraea may also have a minor impact on quantity of produce.	ML	M
Impact quality?	B. pingraea not documented as impacting upon agricultural quality.	L	M

Department of Primary Industries Weed Assessment Record

Scientific Name: *Baccharis pingraea*

Common Name: chilquilla

Agriculture			
Question	Comments	Rating	Confidence
Affect land value?	B. pingraea not documented as affecting land value.	L	M
Change land use?	B. pingraea not documented as causing a change in priority of land use.	L	M
Increase harvest costs?	B. halimifolia 'forms dense impenetrable thickets .. restricting movement of stock and machinery and reducing agricultural and pastoral potential of the infested area' (Parsons & Cuthbertson 2001). 'In western states of US (Baccharis spp.) can form dense thickets along borders and banks of moist areas interfering with irrigation' (Cunningham et al 2004). Possible that B. pingraea could cause a minor increase in cost (time and labour) of harvesting.	M	MH
Disease host/vector?	This species is not documented as a host or vector for disease of agriculture.	L	M
Impact Score			0.2167

Present distribution of *Baccharis pingraea* in Victoria

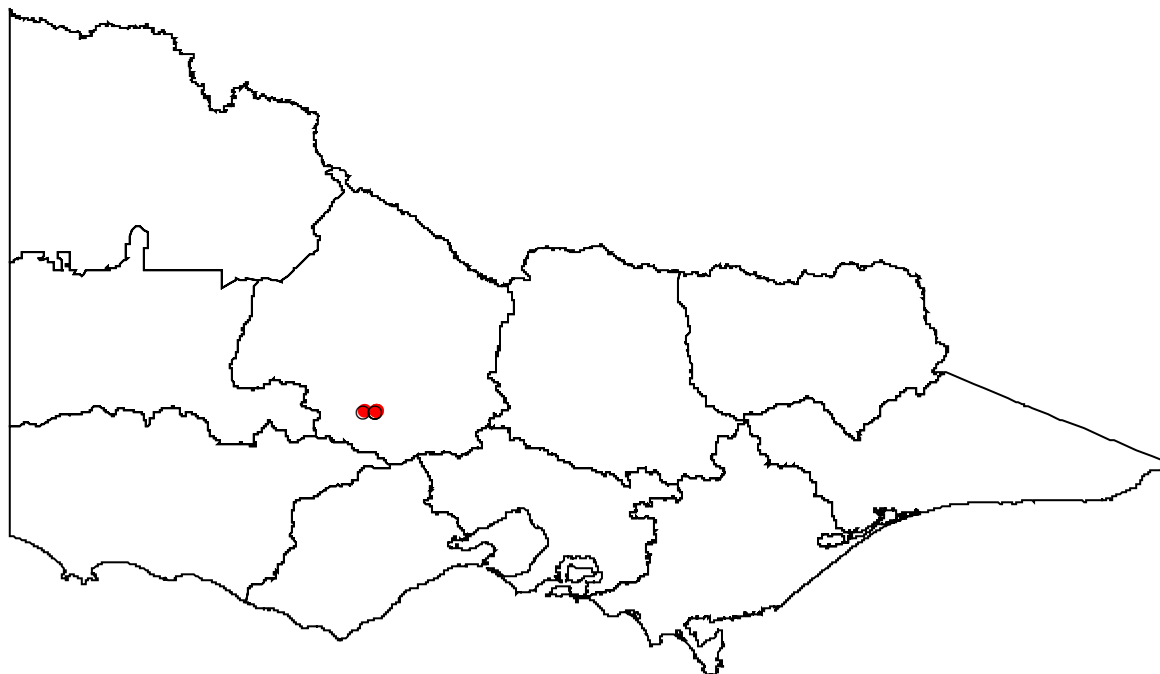
Scientific name: *Baccharis pingraea* DC.

Common name(s): chilquilla

Status:

Habitat:

Weed of agriculture / pastures, natural areas, and roadsides. *Baccharis* spp. can become persistent weeds in flood plains, old fields, or similar habitats (Cunningham *et al* 2004).



Potential distribution of *Baccharis pingraea* in Victoria

Scientific name: *Baccharis pingraea* DC.

Common name(s): chilquilla

Status:

Habitat:

Weed of agriculture / pastures, natural areas, and roadsides. *Baccharis* spp. can become persistent weeds in flood plains, old fields, or similar habitats (Cunningham *et al* 2004).

Potential distribution produced from CLIMATE modelling refined by applying suitable landuse and vegetation type overlays with CMA boundaries

MAP OVERLAYS USED.

Land Use:

Pasture dryland; pasture irrigation

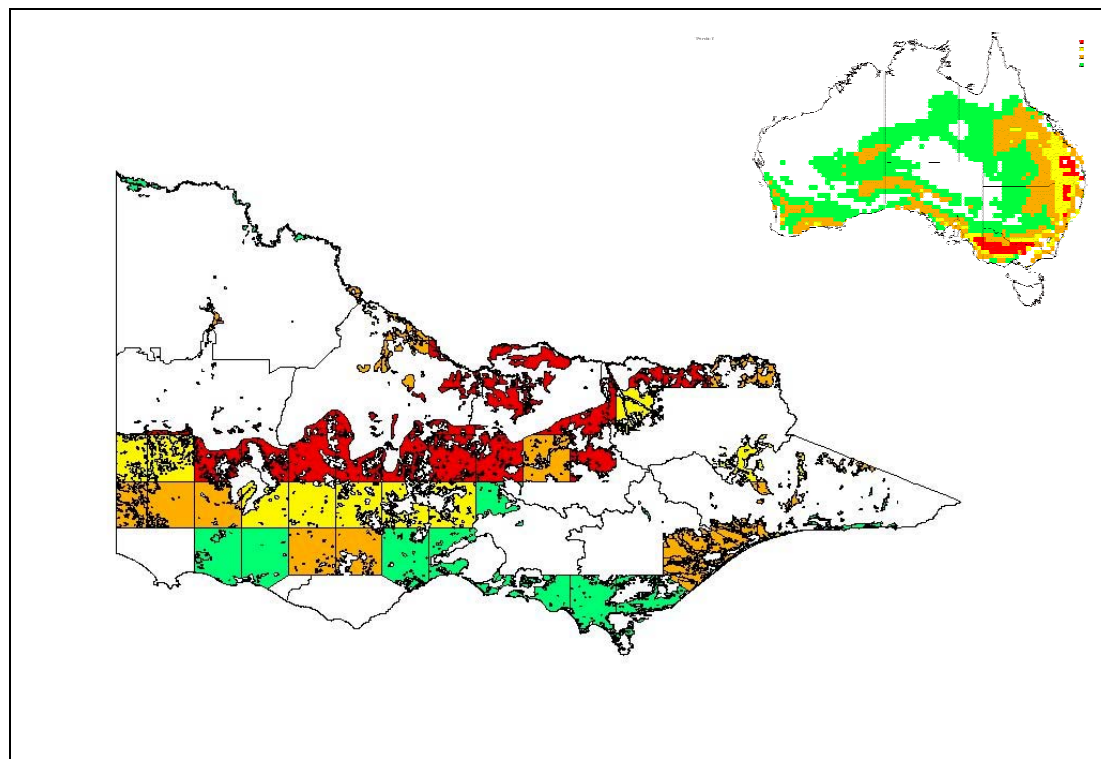
Broad vegetation types

Coastal scrubs and grassland; coastal grassy woodland; heathy woodland; heath; swamp scrub; sedge-rich woodland; grassland; plains grassy woodland; herb-rich woodland; riverine grassy woodland

Colours indicate possibility of *Baccharis pingraea* infesting these areas.

Red	= Very high	Yellow	= High
Orange	= Medium	Green	= Likely

In the non-coloured areas the plant is unlikely to establish as the climate, soil or landuse is not presently suitable.



Department of Primary Industries Weed Assessment Record

Scientific Name: *Carex buechananii*

Common Name: leather leaf sedge

Invasiveness

Establishment			
Question	Comments	Rating	Confidence
Germination requirements?	'Little existing data on Carex germination and dormancy cycling. ...some species had the ability to germinate under a wide range of temperature regimes while other species were only able to germinate under the summer temperature regime' (Kettenring & Galatowitsch 2004). Insufficient information to determine germination requirements for C. buechananii.	M	L
Establishment requirements?	Full sun to part shade (MBG 2005). Can establish under moderate canopy.	MH	M
How much disturbance is required?	Often found on unconsolidated substrates on coastal platforms (Rogers 1989). In NZ, in Big Gully, linked to wetlands and small bogs that are typically very grassy (DOC 2004). Can establish in minor disturbed natural ecosystem.	MH	H

Growth/Competitive			
Question	Comments	Rating	Confidence
Life form?	Rush or sedge (MBG 2005). Lifeform – other.	L	MH
Allelopathic properties?	None described.	L	M
Tolerates herb pressure?	'Aphids and mealy bugs may be a problem in dense clumps' (MBG 2005). "Animal browsing tolerance: Tolerant" (NZERN 2006). Consumed but recovers.	MH	MH
Normal growth rate?	'May be slow to establish after transplanting" (MBG 2005). 'Growth rate: fast' (NZERN 2006). Moderately rapid growth rate.	MH	MH
Stress tolerance to frost, drought, w/logg, sal. etc?	Water: Medium to wet (MBG 2005). 'Tolerances: deer, heat & humidity, pollution, rabbits, seashore, slope, wind' (Backyard Gardener). 'Waterlogging tolerance: high. Frost tolerance: high, Salt wind tolerance: Low, Drought tolerance: medium' (NZERN 2006). Highly tolerant of waterlogging and drought. Susceptible to salinity.	MH	MH

Reproduction			
Question	Comments	Rating	Confidence
Reproductive system	Can be propagated by 'seed or division' (MBG 2005). Rhizomatous (Moore & Edgar 1976). Both vegetative and sexual reproduction.	H	MH
Number of propagules produced?	Some of the Carex spp. are known to 'set a lot of seed' (Collins 2006). Picture indicates around 30 utricles per glume. Possible that one plant may produce greater than 2000 seeds but not documented. Score medium.	M	L
Propagule longevity?	'Very low decay rates and virtually no seed losses due to germination in the soil during burial experiments suggest that Carex seeds are long-lived. Nearly 100% of the buried seeds survived over periods 30-60 months in 12 Carex species' (Schutz 2000). Insufficient information to determine propagule longevity for C. buechananii.	M	L

Department of Primary Industries Weed Assessment Record

Scientific Name: *Carex buechananii*

Common Name: leather leaf sedge

Reproduction			
Question	Comments	Rating	Confidence
Reproductive period?	'Short-lived' (2 to 3 years) (MBG 2005). 'Successional status: Pioneer / colonising' (NZERN 2006). Insufficient evidence to determine whether <i>C. buechananii</i> forms self-sustaining dense monocultures. Assume mature plant produces viable propagules for only 1 – 2 years.	ML	M
Time to reproductive maturity?	'Short-lived' (2 to 3 years) (MBG 2005). Insufficient information to determine whether plant reaches maturity in under a year but would produce propagules between 1 – 2 years after germination.	MH	M
Dispersal			
Question	Comments	Rating	Confidence
Number of mechanisms?	Over 1800 <i>Carex</i> spp. with different dispersal mechanisms. Insufficient information to determine dispersal mechanisms for <i>C. buechananii</i> .	M	L
How far do they disperse?	Over 1800 <i>Carex</i> spp. with different dispersal mechanisms. Insufficient information to determine dispersal distance for <i>C. buechananii</i> .	M	L
Invasiveness Score			0.5858

Department of Primary Industries Weed Assessment Record

Scientific Name: *Carex buechananii*

Common Name: leather leaf sedge

Impact

Social			
Question	Comments	Rating	Confidence
Restrict human access?	'Maximum height: 1000m' (NZERN 2006). Often found on unconsolidated substrates on coastal platforms (Rogers 1989). In NZ, in Big Gully, linked to wetlands and small bogs that are typically very grassy (DOC 2004). Minimal or negligible impact on human access.	L	H
Reduce tourism?	'Its showy red-brown foliage is most striking when planted in groups of 3 or more and will remain attractive year-round' (MBG 2005). Often found on unconsolidated substrates on coastal platforms (Rogers 1989). In NZ, in Big Gully, linked to wetlands and small bogs that are typically very grassy (DOC 2004). Places where weed is found it is unlikely to impede upon the recreational use of the land.	L	H
Injurious to people?	Plant not documented to be injurious to be injurious in any way.	L	MH
Damage to cultural sites?	Plant not likely to have an effect on structure or aesthetics of cultural sites.	L	MH

Abiotic			
Question	Comments	Rating	Confidence
Impact flow?	Found in swamps or seepages, riparian moist banks or lake margins, rainfall more than 800mm (NZERN 2006). Not documented to impact upon flow.	L	MH
Impact water quality?	Found in swamps or seepages, riparian moist banks or lake margins, rainfall more than 800mm (NZERN 2006). Not documented to impact upon water quality.	L	MH
Increase soil erosion?	Rhizomatous (Moore & Edgar 1976). Plants die off after 2 – 3 years (MBG 2005). However, unlikely to cause large scale soil movement.	L	MH
Reduce biomass?	Densely tufted growing up to 100cm. Found 'on the foreshore amongst scrub, in damp ground near streams, in short tussock grassland. (Moore & Edgar 1976). C. buechananii can get top heavy with dead foliage (Collins 2006). In certain situations, may be a direct replacement of biomass by invader.	ML	MH
Change fire regime?	Found in swamps or seepages, riparian moist banks or lake margins, rainfall more than 800mm (NZERN 2006). Due to areas where plant is found, it is unlikely to change the fire regime.	L	MH

Community Habitat			
Question	Comments	Rating	Confidence
Impact on composition High value EVC	EVC=Estuarine flats grassland (BCS =E); CMA=Port Phillip; Bioreg=Gippsland Plain; CLIMATE potential=VH. In the margins of Waituna Lagoon, NZ, C. buechananii is recorded as occurring frequently. Recorded as covering 1% of the transect area surveyed (Sawyer 2004). Very little displacement of any indigenous spp.	L	MH

Department of Primary Industries Weed Assessment Record

Scientific Name: *Carex buechananii*

Common Name: leather leaf sedge

Community Habitat			
Question	Comments	Rating	Confidence
Impact on composition Medium value EVC	EVC=Coastal alkaline scrub (BCS =D); CMA=Port Phillip; Bioreg=Gippsland Plain; CLIMATE potential=VH. In the margins of Waituna Lagoon, NZ, <i>C. buechananii</i> is recorded as occurring frequently. Recorded as covering 1% of the transect area surveyed (Sawyer 2004). Very little displacement of any indigenous spp.	L	MH
Impact on composition Low value EVC	EVC=Coastal tussock grassland (BCS =E); CMA=Port Phillip; Bioreg=Gippsland Plain; CLIMATE potential=VH. In the margins of Waituna Lagoon, NZ, <i>C. buechananii</i> is recorded as occurring frequently. Recorded as covering 1% of the transect area surveyed (Sawyer 2004). Very little displacement of any indigenous spp.	L	MH
Impact on structure?	Found 'on the foreshore amongst scrub, in damp ground near streams, in short tussock grassland. (Moore & Edgar 1976). In the margins of Waituna Lagoon, NZ, <i>C. buechananii</i> is recorded as occurring frequently. Recorded as covering 1% of the transect area surveyed (Sawyer 2004). Minor or negligible effect on <20% of the lower strata. <i>C. Buchananii</i> can get top heavy with dead foliage (Collins 2006). In certain situations, may be a direct replacement of biomass by invader.	L	MH
Effect on threatened flora?	This species is not documented as posing an additional risk to threatened flora.	MH	L
Fauna			
Question	Comments	Rating	Confidence
Effect on threatened fauna?	This species is not documented as posing an additional risk to threatened flora.	MH	L
Effect on non-threatened fauna?	Plant not documented as having an effect on non-threatened fauna species.	L	MH
Benefits fauna?	'Wildlife value: seed / grain' (NZERN 2006). Plant may provide some assistance in food to desirable species.	MH	MH
Injurious to fauna?	Plant not documented as being injurious to fauna.	L	MH
Pest Animal			
Question	Comments	Rating	Confidence
Food source to pests?	'Wildlife value: seed / grain' (NZERN 2006). 'Tolerances: deer, ..rabbits,' (Backyard Gardener). Suggests that rabbits may use <i>C. buechananii</i> as food source but insufficient evidence to support this further.	M	L
Provides harbor?	Weed not documented to provide harbour for pest species.	L	MH
Agriculture			
Question	Comments	Rating	Confidence
Impact yield?	Not a weed of cropping.	L	MH

Department of Primary Industries Weed Assessment Record

Scientific Name: *Carex buechananii*

Common Name: leather leaf sedge

Agriculture			
Question	Comments	Rating	Confidence
Impact quality?	Not a weed of cropping.	L	MH
Affect land value?	Weed not documented to affect land value.	L	MH
Change land use?	Not a weed of agriculture.	L	MH
Increase harvest costs?	Not a weed of agriculture.	L	MH
Disease host/vector?	Not documented as acting as an alternative host or vector for disease of agriculture.	L	MH
Impact Score			0.0996

Present distribution of *Carex buechananii* in Victoria

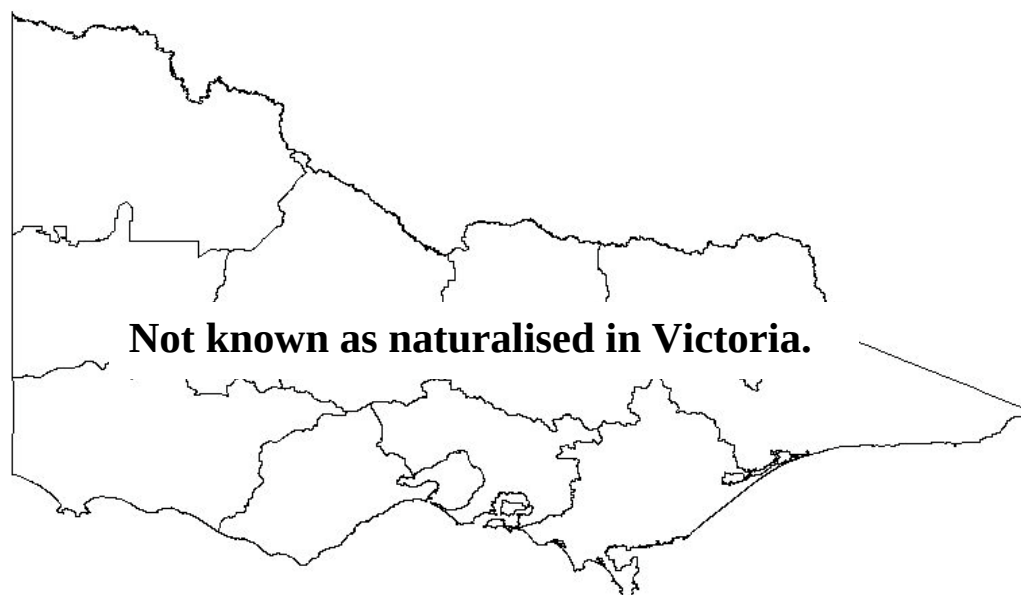
Scientific name: *Carex buechananii* Berggr.

Common name(s): Leather leaf sedge

Status:

Habitat:

Often found on unconsolidated substrates on coastal platforms (Rogers 1989). Found in wetlands and small bogs (DOC 2004). Swamps or seepages, riparian moist banks or lake margins, rainfall more than 800mm (NZERN 2006). On the foreshore amongst scrub, in damp ground near streams, in short tussock grassland, coastal and inland to 900m altitude (Moore & Edgar 1976).



Potential distribution of *Carex buechananii* in Victoria

Scientific name: *Carex buechananii* Berggr.

Common name(s): Leather leaf sedge

Status:

Habitat:

Often found on unconsolidated substrates on coastal platforms (Rogers 1989). Found in wetlands and small bogs (DOC 2004). Swamps or seepages, riparian moist banks or lake margins, rainfall more than 800mm (NZERN 2006). On the foreshore amongst scrub, in damp ground near streams, in short tussock grassland, coastal and inland to 900m altitude (Moore & Edgar 1976).

Potential distribution produced from CLIMATE modelling refined by applying suitable landuse and vegetation type overlays with CMA boundaries

MAP OVERLAYS USED.

Land Use:

Horticulture, Pasture irrigation

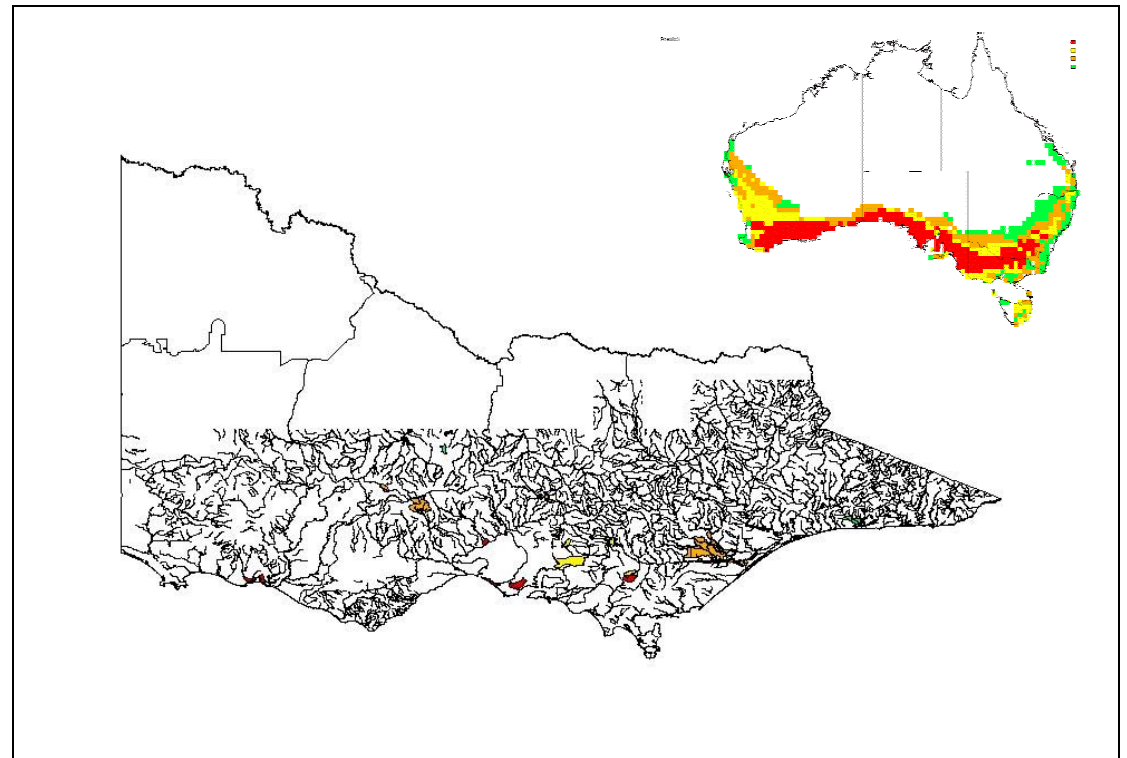
Broad vegetation types

Coastal scrubs and grassland; swamp scrub; sedge-rich woodland; grassland; riverine grassy woodland; riparian forest

Colours indicate possibility of *Carex buechananii* infesting these areas.

 Red	= Very high	 Yellow	= High
 Orange	= Medium	 Green	= Likely

In the non-coloured areas the plant is unlikely to establish as the climate, soil or landuse is not presently suitable.



Department of Primary Industries Weed Assessment Record

Scientific Name: *Clematis vitalba*

Common Name: old man's beard

Invasiveness

Establishment			
Question	Comments	Rating	Confidence
Germination requirements?	'When applied alone, chilling and NO ₃ - increased germination. Light, however, only increased germination when applied with one or both other factors' (Bungard et al 1997). 'Seed is dormant over the first winter and germination rates are considerably enhanced with consistent low winter temperatures' (Muyt 2001). Requires natural seasonal temperatures for germination.	MH	MH
Establishment requirements?	Tolerant of moderate to dense shade although most vigorous in lightly shaded or sunny positions (Muyt 2001). 'Invasions often commence in sunny bushland margins or openings and expand as the canopy dies and light levels increase' (Muyt 2001). Can establish under moderate canopy.	MH	MH
How much disturbance is required?	Weed of forests, woodlands and riparian settings (Muyt 2001). Invades 'forest margins, disturbed bush, shrubland, riverbeds and cliffs (DoC 2005). We argue that <i>C. vitalba</i> is likely to rapidly establish following soil disturbance' (Bungard et al 1997). Can establish in minor disturbed natural ecosystem.	MH	MH

Growth/Competitive			
Question	Comments	Rating	Confidence
Life form?	Perennial woody climbing vine (Bungard et al 1997). Life form – climber.	ML	H
Allelopathic properties?	None described.	L	MH
Tolerates herb pressure?	In Taihape, New Zealand, <i>C. vitalba</i> was 'controlled using a combination of glyphosate application and sheep grazing to control regrowth'. (ISSG 2005). <i>Phytomyza vitalbae</i> released in New Zealand in 1996 for biological control. No information to date regarding success in New Zealand. Capable of seed production under moderate herbivory pressure.	MH	MH
Normal growth rate?	'Grows rapidly' (DoC 2005). 'Large plants may produce several metres of growth each year (Muyt 2001). Rapid growth rate.	H	MH
Stress tolerance to frost, drought, w/logg, sal. etc?	'Plants will recover from drought.' Tolerant of frost (Ogle et al 2000). Effects of fire on the plant are unknown' (Glazik & Rudman 2000). Plant likes well-drained, highly fertile soils (ISSG 2005). Tolerant to at least two and susceptible to at least two.	ML	MH

Reproduction			
Question	Comments	Rating	Confidence
Reproductive system	Can reproduce both sexually and vegetatively through fragmentation (Bungard et al 1997).	H	H
Number of propagules produced?	'Large plants produce more than 100,000 seeds annually' (Muyt 2001). 'An estimated 17 000 viable seeds are produced per 0.5m ² in areas where <i>C. vitalba</i> is a canopy species (ISSG 2005). Produces greater than 2000 propagules per flowering event.	H	MH
Propagule longevity?	'Large plants produce more than 100,000 seeds annually with viability exceeding 75%' (Muyt 2001). 'Seed viability is high initially but drops off over time, with the seedbank lasting five years' (Glazik & Rudman 2000). Seeds survive up to five years.	L	MH

Department of Primary Industries Weed Assessment Record

Scientific Name: *Clematis vitalba*

Common Name: old man's beard

Reproduction			
Question	Comments	Rating	Confidence
Reproductive period?	Perennial vine producing seed after one to three years. 'There can be up to 500 seeds per square metre under dense ground-layer mats as well as thousands of seeds retained on vines over winter' (Muyt 2001). Likely that a mature plant would produce viable propagules for 10 years or more.	H	MH
Time to reproductive maturity?	'Seed production is possible after one to three years, depending on the exposure to full sunlight' (ISSG 2005). Produces propagules between 1-2 years after germination.	MH	MH
Dispersal			
Question	Comments	Rating	Confidence
Number of mechanisms?	Seed dispersal is by 'wind, water, people and animals' (ISSG 2005). Fragments dispersed by 'machinery, water, in garden refuse and during removal' (Muyt 2001). Very light, wind dispersed seeds.	H	MH
How far do they disperse?	'Seeds are easily wind dispersed' (Weber 2003). Many propagules will reach 200 – 1000m.	MH	MH
Invasiveness Score			0.6940

Department of Primary Industries Weed Assessment Record

Scientific Name: *Clematis vitalba*

Common Name: old man's beard

Impact

Social			
Question	Comments	Rating	Confidence
Restrict human access?	A vine scrambling over trees and shrubs. 'Vines climb vigorously over shrubs and trees, while trailing stems form dense, layered mats up to 2m deep...may reach heights of about 25 metres and a single plant may cover an area exceeding 175 square metres.' Weed of forests, woodlands and riparian settings (Muyt 2001). Weed has potential to impede individual access.	ML	MH
Reduce tourism?	Vines can reduce forests to low thicket of vines over stumps and logs (ISSG 2005). 'Vines climb vigorously over shrubs and trees, while trailing stems form dense, layered mats up to 2m deep' (Muyt 2001). Weed would reduce the aesthetics of the land.	ML	MH
Injurious to people?	Plants known to have some toxicity (ISSG 2005). 'The juice when rubbed on the skin will raise blisters; chewing the leaves produces ulcers in the mouth' (Schmidt 2005). Mildly toxic, may cause some physiological issues.	ML	MH
Damage to cultural sites?	Vines can reduce forests to low thicket of vines over stumps and logs (ISSG 2005). 'Vines climb vigorously over shrubs and trees, while trailing stems form dense, layered mats up to 2m deep' (Muyt 2001). Weed would have moderate visual effect.	ML	MH

Abiotic			
Question	Comments	Rating	Confidence
Impact flow?	Terrestrial species	L	H
Impact water quality?	Terrestrial species	L	H
Increase soil erosion?	'Roots becoming woody, sometimes branched, taproot commonly reaching several metres in length' (Muyt 2001). Plant dies off in winter leaving ground exposed. Weed occurs over large area of land. However, unlikely to contribute to large-scale soil movement.	L	MH
Reduce biomass?	'Vines climb vigorously over shrubs and trees, while trailing stems form dense, layered mats up to 2m deep, smothering all ground-flora and preventing any regeneration. .. Deciduous over winter with new foliage emerging in spring' (Muyt 2001). Vines can reduce forests to low thicket of vines over stumps and logs (ISSG 2005). In some instances, biomass may slightly decrease.	MH	MH
Change fire regime?	'Can dominate canopies of any height, producing heavy permanent tangling masses of vines that kill the hosts and the plants beneath it (DoC 2005). The dead vines may act as ladder fuels increasing vertical fuel continuity that may effect intensity and spatial extent of fires (Brooks et al 2004). Minor change to intensity of fire.	ML	MH

Community Habitat			
Question	Comments	Rating	Confidence
Impact on composition High value EVC	EVC=Clay heathland (BCS =V); CMA=East Gippsland; Bioreg=East Gippsland Lowlands; CLIMATE potential=VH. Vines form a dense canopy suppressing all vegetation beneath it reducing forests to a low thicket of vines scrambling over stumps and logs (ISSG 2005). Potential to displace all species within a strata.	H	MH

Department of Primary Industries Weed Assessment Record

Scientific Name: *Clematis vitalba*

Common Name: old man's beard

Community Habitat			
Question	Comments	Rating	Confidence
Impact on composition Medium value EVC	EVC=Riparian forest (BCS =D); CMA=East Gippsland; Bioreg=East Gippsland Lowlands; CLIMATE potential=VH. Vines form a dense canopy suppressing all vegetation beneath it reducing forests to a low thicket of vines scrambling over stumps and logs (ISSG 2005). Potential to displace all species within a strata.	H	MH
Impact on composition Low value EVC	EVC=Riparian forest (BCS =V); CMA=East Gippsland; Bioreg=East Gippsland Uplands; CLIMATE potential=VH. Vines form a dense canopy suppressing all vegetation beneath it reducing forests to a low thicket of vines scrambling over stumps and logs (ISSG 2005). Potential to displace all species within a strata.	H	MH
Impact on structure?	Vines form a dense canopy suppressing all vegetation beneath it reducing forests to a low thicket of vines scrambling over stumps and logs (ISSG 2005). In Taihape reserve, NZ, 25% of understorey trees lost (Ogle 2000). 'Can dominate canopies of any height, producing heavy permanent tangling masses of vines that kill the hosts and the plants beneath it (DoC 2005). Major effects on all layers.	H	H
Effect on threatened flora?	This species is not documented as posing an additional risk to threatened flora.	MH	L
Fauna			
Question	Comments	Rating	Confidence
Effect on threatened fauna?	This species is not documented as posing an additional risk to threatened fauna.	MH	L
Effect on non-threatened fauna?	'Can dominate canopies of any height, producing heavy permanent tangling masses of vines that kill the hosts and the plants beneath it (DoC 2005). Weed may lead to reduction in habitat and / or food for non-threatened fauna species.	ML	MH
Benefits fauna?	Plant not documented as providing any benefits to indigenous fauna.	H	MH
Injurious to fauna?	'The occasional death of cattle from eating this plant has been recorded in England' (Roy et al 2004). Possible that the weed may also effect indigenous fauna although no documented evidence to support this. Therefore score as medium.	M	MH
Pest Animal			
Question	Comments	Rating	Confidence
Food source to pests?	Weed not documented as a food source to pest species.	L	MH
Provides harbor?	Weed not documented as providing harbour for pest species.	L	MH
Agriculture			
Question	Comments	Rating	Confidence
Impact yield?	Not a weed of agriculture.	L	MH

Department of Primary Industries Weed Assessment Record

Scientific Name: *Clematis vitalba*

Common Name: old man's beard

Agriculture			
Question	Comments	Rating	Confidence
Impact quality?	Not a weed of agriculture.	L	MH
Affect land value?	Weed not documented as affecting land value.	L	MH
Change land use?	Weed not known to cause a change in priority of land use.	L	MH
Increase harvest costs?	Not a weed of cropping.	L	MH
Disease host/vector?	Not a known host or vector for disease of agriculture.	L	MH
Impact Score			0.3843

Present distribution of *Clematis vitalba* in Victoria

Scientific name: *Clematis vitalba* L.

Common name(s): old-man's beard, traveller's joy

Status:

Habitat:

Native to Europe. Requires highly fertile soils with good drainage. Native ranges climate is temperate and moist (ISSG 2005). Grows in riparian forests and forest edges, generally on rich and mesic soils, and predominates in early successional forests. (Weber 2003). Weed of forests, woodlands and riparian settings (Muyt 2001). Also grows in wasteland, along roadsides, in hedges and disturbed forests.



Potential distribution of *Clematis vitalba* in Victoria

Scientific name: *Clematis vitalba* L.

Common name(s): old-man's beard, traveller's joy

Status:

Habitat:

Native to Europe. Requires highly fertile soils with good drainage. Native ranges climate is temperate and moist (ISSG 2005). Grows in riparian forests and forest edges, generally on rich and mesic soils, and predominates in early successional forests. (Weber 2003). Weed of forests, woodlands and riparian settings (Muyt 2001). Also grows in wasteland, along roadsides, in hedges and disturbed forests.

Potential distribution produced from CLIMATE modelling refined by applying suitable landuse and vegetation type overlays with CMA boundaries

MAP OVERLAYS USED.

Land Use:

Forest private plantation; forest public plantation; horticulture; pasture irrigation

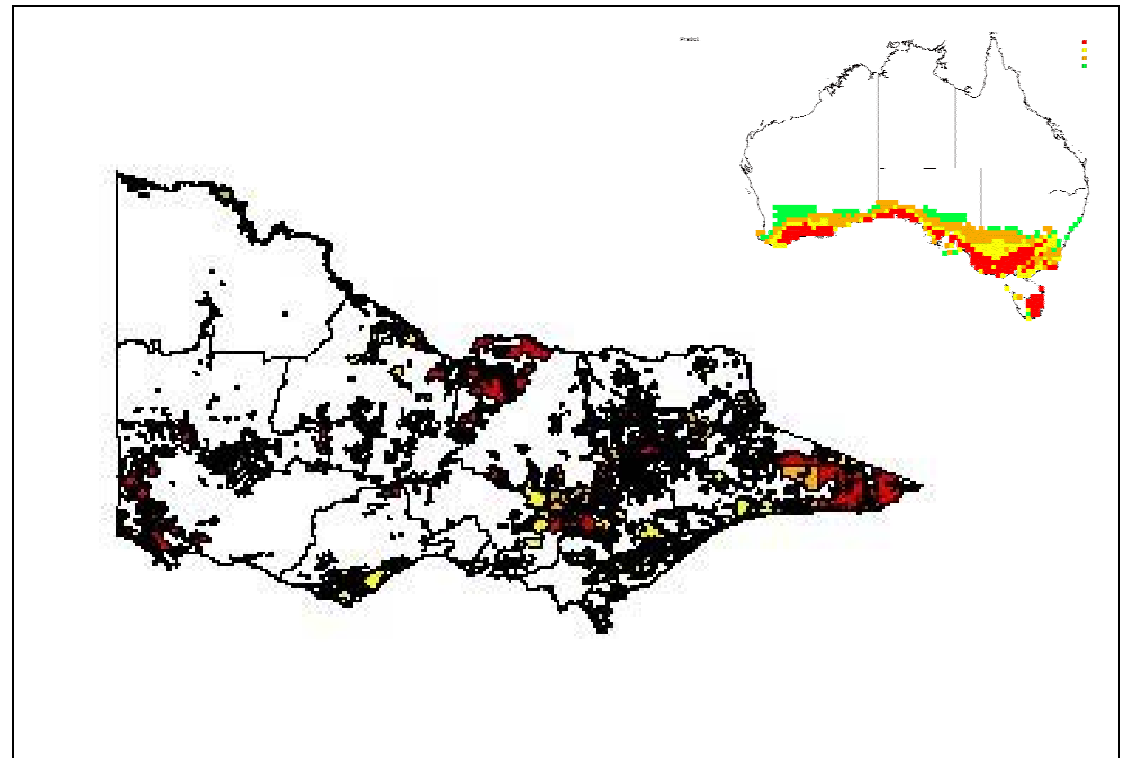
Broad vegetation types

Coastal scrubs and grassland; coastal grassy woodland; heathy woodland; lowland forest; heath; swamp scrub; box ironbark forest; inland slopes woodland; sedge-rich woodland; moist foothill forest; montane dry woodland; montane moist forest; grassland; plains grassy woodland; valley grassy forest; herb-rich woodland; montane grassy woodland; riverine grassy woodland; riparian forest

Colours indicate possibility of *Clematis vitalba* infesting these areas.

Red	= Very high	Yellow	= High
Orange	= Medium	Green	= Likely

In the non-coloured areas the plant is unlikely to establish as the climate, soil or landuse is not presently suitable.



Department of Primary Industries Weed Assessment Record

Scientific Name: *Cylindropuntia tunicata*

Common Name: abrojo

Invasiveness

Establishment			
Question	Comments	Rating	Confidence
Germination requirements?	Although the literature reports that <i>C. tunicata</i> reproduces primarily vegetatively, information is lacking on the specifics of germination. 'New plants can grow from any segment or fruit that comes into contact with the ground. Growth only occurs if conditions are suitable.' (J. Hosking 2006. pers. comm., 19 June). Score medium.	M	L
Establishment requirements?	<i>C. tunicata</i> will grow in shade – not dense shade. (J. Hosking 2006. pers. comm., 19 June). Can establish under moderate canopy.	MH	MH
How much disturbance is required?	Found in grasslands, very open woodlands and pastures (FNA 2002). Can establish in minor disturbed natural ecosystem.	MH	MH
Growth/Competitive			
Question	Comments	Rating	Confidence
Life form?	Perennial shrub (Benson 1982). Life from – other.	L	H
Allelopathic properties?	None described.	L	M
Tolerates herb pressure?	Their spines readily penetrate the flesh of domestic grazing animals' (WSC 2004). Currently 'no effective biological controls available' (Laity 2005).). 'Is damaged by the cochineal insect (a form of <i>Dactylopius tomentosus</i>)' (Hosking 2006). Capable of flowering under moderate herbivory pressure.	MH	MH
Normal growth rate?	'If conditions are warm and wet plants grow rapidly. Segment number may double in a few months under suitable conditions.' (J. Hosking 2006. pers. comm., 19 June). Moderately rapid growth rate that will equal competitive species of the same life form.	MH	MH
Stress tolerance to frost, drought, w/logg, sal. etc?	Drought-tolerant. Can withstand temperatures to -9.4°C (Whitinger 2001). Susceptible to water-logging. Tolerant of salinity. Highly tolerant of at least 2 susceptible to at least 1.	MH	ML
Reproduction			
Question	Comments	Rating	Confidence
Reproductive system	Ability to vegetatively reproduce (Laity 2005). <i>Opuntia rosea</i> has sterile seeds although 'the fruit can take root and form a new plant just like any vegetative part of the plant' (Stirton 1978). <i>C. tunicata</i> 'fruits usually sterile' (FNA 2004). Primarily vegetative reproduction.	MH	MH
Number of propagules produced?	Insufficient information to determine number of propagules produced.	M	L
Propagule longevity?	Ability to vegetatively reproduce (Laity 2005). Vegetatively reproduces.	L	M
Reproductive period?	Some of the <i>Cylindropuntia</i> spp. form self-sustaining monocultures. Insufficient information to determine if <i>C. tunicata</i> does also. Score medium.	M	L

Department of Primary Industries Weed Assessment Record

Scientific Name: *Cylindropuntia tunicata*

Common Name: abrojo

Reproduction			
Question	Comments	Rating	Confidence
Time to reproductive maturity?	Through vegetative reproduction, plant can reach reproductive maturity in a few weeks (J. Hosking 2006. pers. comm., 19 June). Under a year.	H	MH
Dispersal			
Question	Comments	Rating	Confidence
Number of mechanisms?	'Cylindropuntia tunicata appears to be spread by movement of segments. Seed is produced, but this does not appear to be a source of dispersal as fruit does not appear to be eaten by Australian animals and seed does not separate from fruit' (Hosking 2006). Joints easily detached (Britton & Rose 1919). Spread by water, animals and light vehicular traffic.	MH	MH
How far do they disperse?	'Abrojo is able to easily spread via seed or break into segments and be carried by water, vehicle tyres and animals" (Laity 2005). Possible that many propagules will disperse 200 – 1000m via attachment to vehicles or mobile animals.	MH	M
Invasiveness Score			0.6234

Department of Primary Industries Weed Assessment Record

Scientific Name: *Cylindropuntia tunicata*

Common Name: abrojo

Impact

Social			
Question	Comments	Rating	Confidence
Restrict human access?	'If uncontrolled the plant can also form relatively dense infestations that are unsafe for an animal to walk through' (WSC 2004). Has 'numerous, long, tough, sharp, sheathed spines, which can penetrate leather boots, vehicle tyres and animals' (Laity 2005). Grows to 60cm (Britton & Rose 1919). Some of the <i>Cylindropuntia</i> spp. 'form impenetrable thickets or barriers that prevent access to streams, pastures, shade trees or plantations' (Klein 2002). In the case of dense infestations, major impediment to access waterways.	H	MH
Reduce tourism?	Grows mainly in grasslands or pastures (FNA 2002). Unlikely to affect recreational use of the land.	L	MH
Injurious to people?	'Their spines readily penetrate the flesh of domestic grazing animals' (WSC 2004). Spines 4 to 5 cm long with thin, white, papery sheaths. (Britton & Rose 1919). Spines throughout the year.	H	MH
Damage to cultural sites?	Weed unlikely to cause damage to indigenous or European cultural site.	L	MH

Abiotic			
Question	Comments	Rating	Confidence
Impact flow?	Terrestrial species	L	MH
Impact water quality?	Terrestrial species	L	MH
Increase soil erosion?	Many of the <i>Cylindropuntia</i> spp. have fibrous root systems (Britton 1919). Unlikely to contribute to large scale soil movement.	L	MH
Reduce biomass?	<i>C. rosea</i> and <i>O. aurantiaca</i> 'tend to displace the natural vegetation (Stirton 1978). Possible that <i>C. tunicata</i> will do the same. Tends to occur in grasslands or open spaces. Biomass may increase slightly.	L	MH
Change fire regime?	Possible that <i>Opuntia</i> spp. with decreased plant tissue flammability will decrease fire frequency and intensity (Brooks et al 2004). Minor change to frequency and intensity.	ML	H

Community Habitat			
Question	Comments	Rating	Confidence
Impact on composition High value EVC	EVC= semi-arid woodland (BCS=V); CMA=Mallee; Bioregion= Murray Mallee; CLIMATE potential=VH. 'Bushy or mat-forming and creeping' (Benson 1982). 'If uncontrolled the plant can also form relatively dense infestations' (WSC 2004). Minor displacement of some dominant species within the lower layer.	ML	M
Impact on composition Medium value EVC	EVC= semi-arid woodland (BCS=D); CMA=Mallee; Bioregion= Lowan Mallee; CLIMATE potential=VH. 'Bushy or mat-forming and creeping' (Benson 1982). 'If uncontrolled the plant can also form relatively dense infestations' (WSC 2004). Minor displacement of some dominant species within the lower layer.	ML	M

Department of Primary Industries Weed Assessment Record

Scientific Name: *Cylindropuntia tunicata*

Common Name: abrojo

Community Habitat			
Question	Comments	Rating	Confidence
Impact on composition Low value EVC	EVC= lowan sands mallee (BCS=LC); CMA=Mallee; Bioregion= Lowan Mallee; CLIMATE potential=VH. 'Bushy or mat-forming and creeping' (Benson 1982). 'If uncontrolled the plant can also form relatively dense infestations' (WSC 2004). Minor displacement of some dominant species within the lower layer.	ML	M
Impact on structure?	Tends to be found in grasslands or very open woodlands. 'Bushy or mat-forming and creeping' (Benson 1982). 'If uncontrolled the plant can also form relatively dense infestations' (WSC 2004). Minor effect on lower 20 – 60% of ground layer.	ML	M
Effect on threatened flora?	This species is not documented as posing an additional risk to threatened flora.	MH	L
Fauna			
Question	Comments	Rating	Confidence
Effect on threatened fauna?	This species is not documented as posing an additional risk to threatened fauna.	MH	L
Effect on non-threatened fauna?	Weed not documented to have an effect on non-threatened fauna spp.	L	M
Benefits fauna?	Weed not documented to provide benefits to desirable species.	H	M
Injurious to fauna?	'Their spines readily penetrate the flesh of domestic grazing animals, thereby harming the animal' (WSC 2004). Likely that the weed could also affect indigenous fauna. Large spines dangerous to fauna.	H	M
Pest Animal			
Question	Comments	Rating	Confidence
Food source to pests?	Weed not documented to provide food for pest animals.	L	M
Provides harbor?	Weed not documented to provide harbour for pest spp.	L	M
Agriculture			
Question	Comments	Rating	Confidence
Impact yield?	'Their spines readily penetrate the flesh of domestic grazing animals, thereby harming the animal' (WSC 2004). <i>O. aurantiaca</i> and <i>C. rosea</i> 'attach themselves to the coat, feet or mouths of livestock, causing economic losses and a lot of suffering to the animals' (Klein 2002). No documented evidence relating to <i>C. tunicata</i> , although possible that quantity of produce could be affected. Score medium.	M	L
Impact quality?	'Their spines readily penetrate the flesh of domestic grazing animals, thereby harming the animal' (WSC 2004). <i>O. aurantiaca</i> and <i>C. rosea</i> 'attach themselves to the coat, feet or mouths of livestock, causing economic losses and a lot of suffering to the animals' (Klein 2002). No documented evidence relating to <i>C. tunicata</i> , although possible that quality of produce (eg. spines in wool of sheep) could be affected. Score medium.	M	L

Department of Primary Industries Weed Assessment Record

Scientific Name: *Cylindropuntia tunicata*

Common Name: abrojo

Agriculture			
Question	Comments	Rating	Confidence
Affect land value?	O. aurantiaca infestations 'seriously inhibit pastoral activities and result in a marked devaluation in the price of infested land' 'Control can be very costly' (Stirton 1978). Possible that C. tunicata could have a similar impact but no documented evidence. Score medium.	M	L
Change land use?	O. aurantiaca infestations 'seriously inhibit pastoral activities and result in a marked devaluation in the price of infested land' 'Control can be very costly' (Stirton 1978). Possible that C. tunicata could cause a change in priority of land use but no documented evidence. Score medium.	M	L
Increase harvest costs?	'Their spines readily penetrate the flesh of domestic grazing animals, thereby harming the animal' (WSC 2004). Spines can get stuck in wool of sheep. Minor increase in time and labour.	M	M
Disease host/vector?	Weed not documented to act as an alternative host or vector for disease.	L	M
Impact Score			0.3532

Present distribution of *Cylindropuntia tunicata* in Victoria

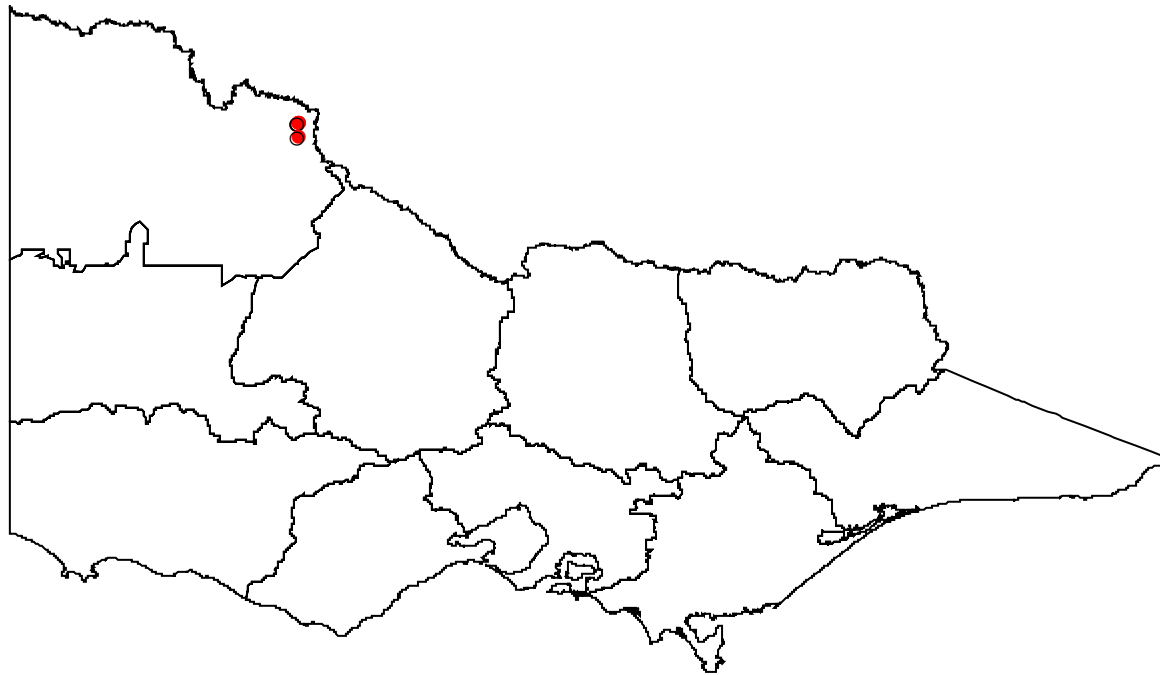
Scientific name: *Cylindropuntia tunicata* (Lehm.) F.M. Knuth

Common name(s): Abrojo, sheathed cholla, chain-link cactus

Status:

Habitat:

Found in sandy to gravelly substrates, usually calcareous slopes or alluvium (FNA 2002). Sandy grasslands. Highlands of central Mexico. In Ecuador, along river dominated by thorny shrubs. Sandy slopes, dry rocky slopes.



Potential distribution of *Cylindropuntia tunicata* in Victoria

Scientific name: *Cylindropuntia tunicata* (Lehm.) F.M. Knuth

Common name(s): Abrojo, sheathed cholla, chain-link cactus

Status:

Habitat:

Found in sandy to gravelly substrates, usually calcareous slopes or alluvium (FNA 2002). Sandy grasslands. Highlands of central Mexico. In Ecuador, along river dominated by thorny shrubs. Sandy slopes, dry rocky slopes.

Potential distribution produced from CLIMATE modelling refined by applying suitable landuse and vegetation type overlays with CMA boundaries

MAP OVERLAYS USED.

Land Use:

Pasture dryland

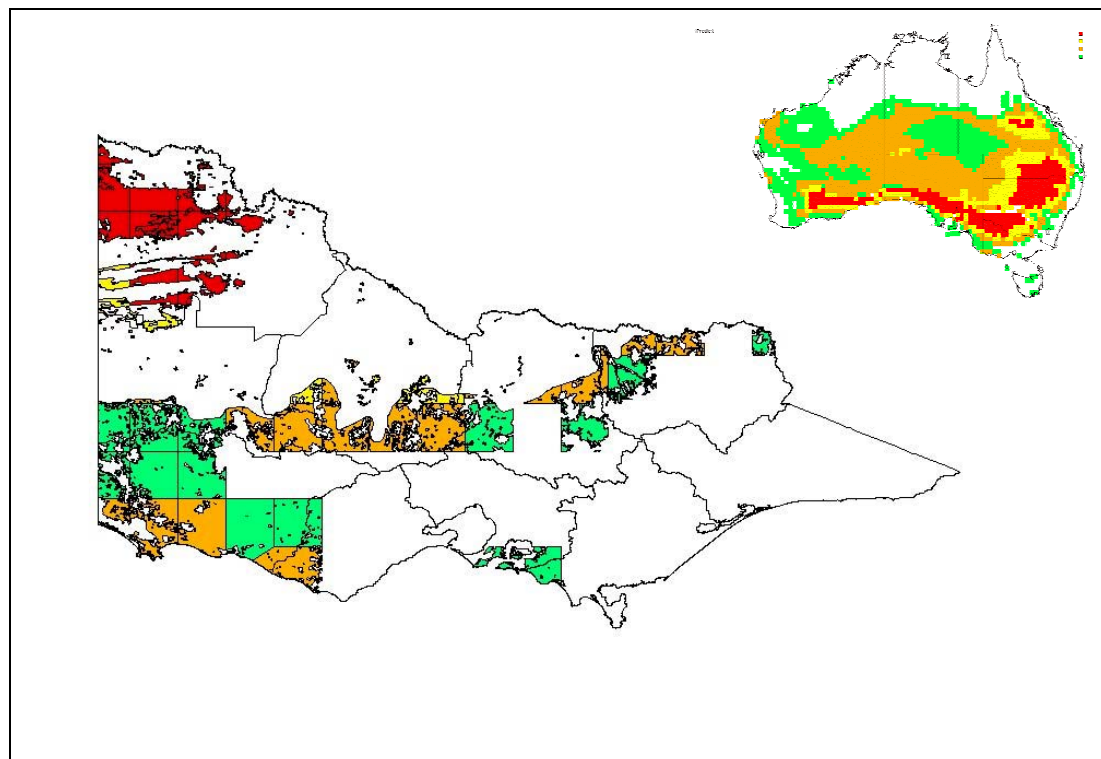
Broad vegetation types

Coastal scrubs and grassland; coastal grassy woodland; grassland; plains grassy woodland; rainshadow woodland; mallee; boinka-raak; mallee woodland; Wimmera / mallee woodland

Colours indicate possibility of *Cylindropuntia tunicata* infesting these areas.

Red	= Very high	Yellow	= High
Orange	= Medium	Green	= Likely

In the non-coloured areas the plant is unlikely to establish as the climate, soil or landuse is not presently suitable.



Department of Primary Industries Weed Assessment Record

Scientific Name: *Erica discolor* ssp. *andreseanthus*

Common Name:

Invasiveness

Establishment			
Question	Comments	Rating	Confidence
Germination requirements?	Sow in Autumn (Sanbi, 2006).	MH	M
Establishment requirements?	Usually grow in a sunny position (Schumann et al, 1992), however, Underhill (1971) has observed members of the genus germinating in some shade.	MH	M
How much disturbance is required?	Unknown	M	L

Growth/Competitive			
Question	Comments	Rating	Confidence
Life form?	Shrub (Schumann et al, 1992).	L	MH
Allelopathic properties?	No data	M	L
Tolerates herb pressure?	"Young tips of heathers are useful as food...for cattle, ponies, sheep, lambs, deer and grouse" (Underhill, 1931).	MH	MH
Normal growth rate?	No data	M	L
Stress tolerance to frost, drought, w/logg, sal. etc?	Evidence of the ability to resprout after fire (Bell & Ojeda, 1999). It is safe to assume that Cape heaths must not receive a frost. Most cultivated heathers hate being dry (Heather Society, 2006). No data found for other tolerances.	L	M

Reproduction			
Question	Comments	Rating	Confidence
Reproductive system	Seed (Underhill, 1971). No further information found.	ML	L
Number of propagules produced?	No information found.	M	L
Propagule longevity?	"Seeds are minute" (Marloth, 1932). "Fine seed rapidly loses its viability" (Underhill, 1971).	L	M
Reproductive period?	"Little is known about the age to which plants of Ericoideae can grow...Many of the smaller shrubby species have a limited lifespan. Populations of these species in the Cape can easily become moribund after a period of 20-30 years," Linder, 1991).	H	H
Time to reproductive maturity?	No data found.	M	L

Department of Primary Industries Weed Assessment Record

Scientific Name: *Erica discolor* ssp. *andreseanthus*

Common Name:

Dispersal			
Question	Comments	Rating	Confidence
Number of mechanisms?	"The [Erica] seeds are minute and consequently easily scattered by the wind," (Marloth, 1932).	H	MH
How far do they disperse?	No data found.	M	L
Invasiveness Score			0.5956

Department of Primary Industries Weed Assessment Record

Scientific Name: *Erica discolor* ssp. *andrewsanthus*

Common Name:

Impact

Social			
Question	Comments	Rating	Confidence
Restrict human access?	No data found.	M	L
Reduce tourism?	Dense shrub to 1.5m with pink, red or white flowers (Bond & Goldblatt, 1984)., like several Victorian heath species.	L	MH
Injurious to people?	"None of our [south African] heath species possess injurious properties," (Marloth, 1932).	L	MH
Damage to cultural sites?	Dense shrub to 1.5m with pink, red or white flowers (Bond & Goldblatt, 1984), like several Victorian heath species.	L	MH
Abiotic			
Question	Comments	Rating	Confidence
Impact flow?	Occupies drier habitats (Schumann et al, 1992). Unlikely to impact on aquatic systems.	L	MH
Impact water quality?	Occupies drier habitats (Schumann et al, 1992). Unlikely to impact on aquatic systems.	L	MH
Increase soil erosion?	Woody shrub (Schumann et al, 1992) likely to reduce erosion.	L	MH
Reduce biomass?	No data found.		M
Change fire regime?	Evidence of the ability to resprout after fire (Bell & Ojeda, 1999). No further information found.	M	L
Community Habitat			
Question	Comments	Rating	Confidence
Impact on composition High value EVC	EVC=Plains Grassy Woodland (V); CMA=Wimmera; Bioregion=Greater Grampians; VH CLIMATE potential. No data found on invasive characteristics.	M	L
Impact on composition Medium value EVC	EVC=Woorinen Sands Mallee (D); CMA=Mallee; Bioregion=Murray Mallees; VH CLIMATE potential.No data found on invasive characteristics.	M	L
Impact on composition Low value EVC	EVC=Heathy Woodland (LC); CMA=Wimmera; Bioregion=Greater Grampians; VH CLIMATE potential.No data found on invasive characteristics.	M	L
Impact on structure?	No data found on invasive characteristics.	M	L
Effect on threatened flora?	No data found on invasive characteristics.	MH	L

Department of Primary Industries Weed Assessment Record

Scientific Name: *Erica discolor* ssp. *andreseanthus*

Common Name:

Fauna			
Question	Comments	Rating	Confidence
Effect on threatened fauna?	No data found on invasive characteristics.	MH	L
Effect on non-threatened fauna?	No data found on invasive characteristics.	M	L
Benefits fauna?	"Young birds can shelter under the plants" (Underhill, 1931).	MH	M
Injurious to fauna?	"None of our [South African] heath species possess injurious properties," (Marloth, 1932).	L	MH
Pest Animal			
Question	Comments	Rating	Confidence
Food source to pests?	"Young tips of heathers are useful as food...for cattle, ponies, sheep, lambs, deer and grouse" (Underhill, 1931).	ML	M
Provides harbor?	"Young birds can shelter under the plants" (Underhill, 1931).	ML	M
Agriculture			
Question	Comments	Rating	Confidence
Impact yield?	No record of this species invading cultivated land.	L	L
Impact quality?	No record of this species invading cultivated land.	L	L
Affect land value?	No record of this species invading cultivated land.	L	L
Change land use?	No record of this species invading cultivated land.	L	L
Increase harvest costs?	No record of this species invading cultivated land.	L	L
Disease host/vector?	No information found.	M	L
Impact Score			0.2612

Present distribution of *Erica discolor* in Victoria

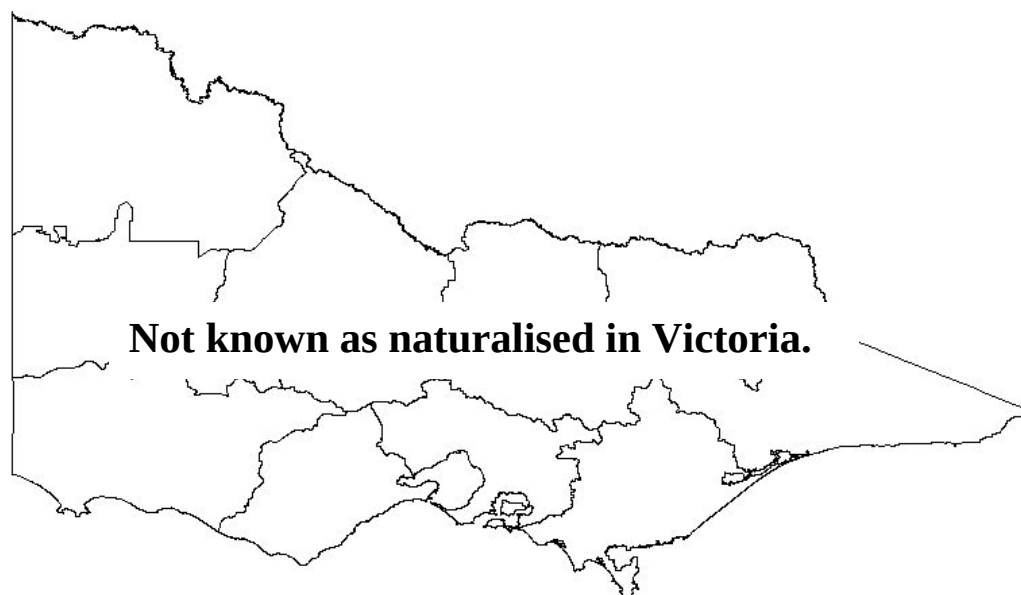
Scientific name: *Erica discolor* Andrews

Common name(s): erica

Status:

Habitat:

Native to South Africa. A dense shrub found on coastal and lower mountain slopes in Witterberg and Stellenbosch to Swellendam (Bond 1984). Grows in dry, open habitats on or near rocks or open sandy areas (Schumann et al 1992). In New Zealand it is known on Banks Peninsula, Diamond Harbour ,Te Ara Crescent (GBIF 1996).



Potential distribution of *Erica discolor* in Victoria

Scientific name: *Erica discolor* Andrews

Common name(s): erica

Status:

Habitat:

Native to South Africa. A dense shrub found on coastal and lower mountain slopes in Witterberg and Stellenbosch to Swellendam (Bond 1984). Grows in dry, open habitats on or near rocks or open sandy areas (Schumann et al 1992). In New Zealand it is known on Banks Peninsula, Diamond Harbour, Te Ara Crescent (GBIF 1996).

Potential distribution produced from CLIMATE modelling refined by applying suitable landuse and vegetation type overlays with CMA boundaries

MAP OVERLAYS USED.

Land Use:

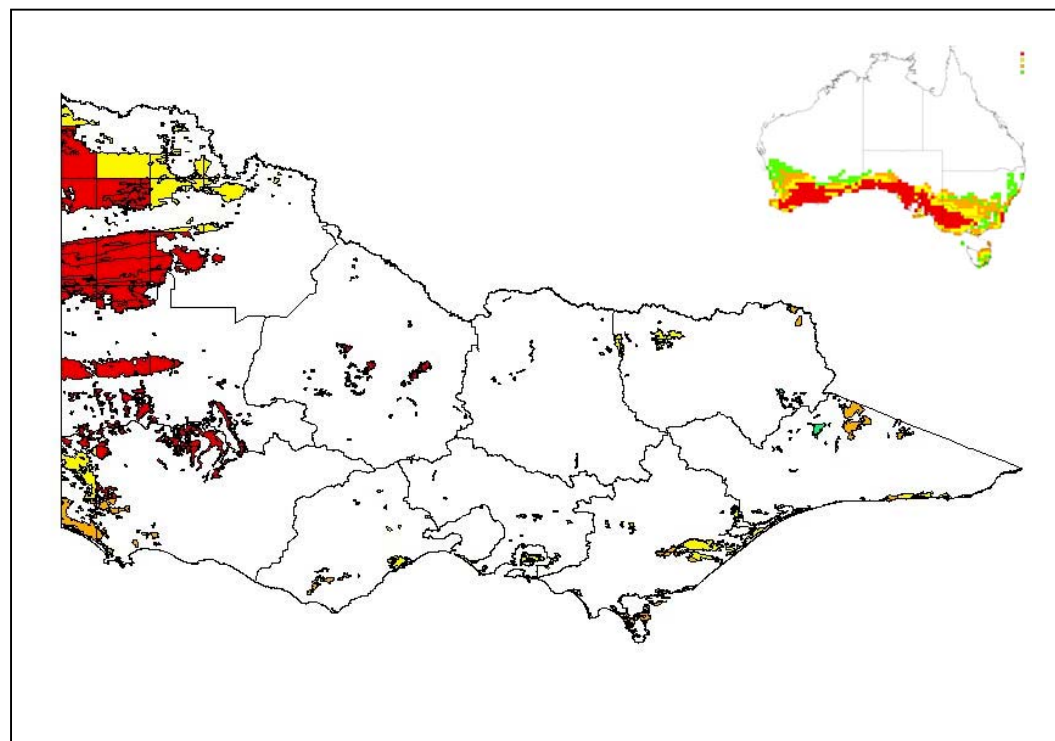
Broad vegetation types

Coastal scrubs and grassland; coastal grassy woodland; heathy woodland, heath, inland slopes woodland, grassland, plains grassy woodland; montane grassy woodland; rainshadow woodland, mallee; boinka-raak; mallee woodland; wimmera / mallee woodland

Colours indicate possibility of *Cylindropuntia tunicata* infesting these areas.

Red	= Very high	Yellow	= High
Orange	= Medium	Green	= Likely

In the non-coloured areas the plant is unlikely to establish as the climate, soil or landuse is not presently suitable.



Department of Primary Industries Weed Assessment Record

Scientific Name: *Erica glandulosa*

Common Name:

Invasiveness

Establishment			
Question	Comments	Rating	Confidence
Germination requirements?	Sow in Autumn (Sanbi, 2006).	MH	M
Establishment requirements?	Found naturalised near the Grampians in partial shade to full sun and also in a gully (Blood, 2003). Populations of <i>E. glandulosa</i> were found to have "declined significantly, apparently as a result of competition or shading from taller, more aggressive weeds, mainly Bracken (<i>Pteridium esculentum</i>) and Tree Erica (<i>E. arborea</i>);" Found in "disturbed remnant [eucalypt] bushland" (Turner & Conran, 2004).	MH	M
How much disturbance is required?	<i>E. glandulosa</i> observed naturalised in a slashed easement through shrubby <i>Euclayptus</i> - <i>Angophora</i> woodland (Hosking et al, 2003). Found in "disturbed remnant bushland" (Turner & conran, 2004).	ML	M

Growth/Competitive			
Question	Comments	Rating	Confidence
Life form?	Shrub (Hosking et al, 2003).	L	H
Allelopathic properties?	No data found.	M	L
Tolerates herb pressure?	"Young tips of heathers are useful as food...for cattle, ponies, sheep, lambs, deer and grouse" (Underhill, 1931).	MH	M
Normal growth rate?	"Strong grower" (SANBI, 2006).	MH	M
Stress tolerance to frost, drought, w/logg, sal. etc?	Evidence of the ability to resprout after fire (Bell & Ojeda, 1999). <i>E. glandulosa</i> forms part of a coastal fynbos community (RES, 2002). Frost-tolerant (Turner & Conran, 2004).	MH	M

Reproduction			
Question	Comments	Rating	Confidence
Reproductive system	"The breeding system of this species is as yet unknown...whether it is cross-. Or self-pollinated (Turner & Conran, 2004).	ML	L
Number of propagules produced?	Estimated to be able to produce over one million seeds in a year (Turner & Conran, 2004).	H	H
Propagule longevity?	"Seeds are minute" (Marloth, 1932). "Fine seed rapidly loses its viability" (Underhill, 1971).	L	M
Reproductive period?	"Little is known about the age to which plants of <i>Ericoideae</i> can grow...Many of the smaller shrubby species have a limited lifespan. Populations of these species in the Cape can easily become morbund after a period of 20-30 years," Linder, 1991).	H	H
Time to reproductive maturity?	No data found.	M	L

Department of Primary Industries Weed Assessment Record

Scientific Name: *Erica glandulosa*

Common Name:

Dispersal			
Question	Comments	Rating	Confidence
Number of mechanisms?	"The [Erica] seeds are minute and consequently easily scattered by the wind," (Marloth, 1932).	H	H
How far do they disperse?	At an infestation originating from a residential area there is evidence that seed has spread up to 45m from the main infestation (Hosking et al, 2003).	L	H
Invasiveness Score			0.5228

Department of Primary Industries Weed Assessment Record

Scientific Name: *Erica glandulosa*

Common Name:

Impact

Social			
Question	Comments	Rating	Confidence
Restrict human access?	Naturalised population in Australia consists of 67 mature individuals in small groups of 2-5 plants over about 1000 sq. m (Turner & Conran, 2004). Unlikely to impede access by humans.	L	H
Reduce tourism?	Shrub to 1m high (Hosking et al, 2003) with pink to orange flowers (Schumann et al, 1992) like several Victorian heaths.	L	MH
Injurious to people?	"None of our [south African] heath species possess injurious properties," (Marloth, 1932).	L	H
Damage to cultural sites?	Shrub to 1m high (Hosking et al, 2003) with pink to orange flowers (Schumann et al, 1992) like several Victorian heaths.	L	MH
Abiotic			
Question	Comments	Rating	Confidence
Impact flow?	Found on well drained soils in its native range (Turner & Conran, 2004). Unlikely to impact on aquatic systems.	L	H
Impact water quality?	Found on well drained soils in its native range (Turner & Conran, 2004). Unlikely to impact on aquatic systems.	L	H
Increase soil erosion?	Long-lived shrub (Turner & Conran, 2004), likely to reduce erosion.	L	M
Reduce biomass?	No data found.	M	L
Change fire regime?	Evidence of the ability to resprout after fire (Bell & Ojeda, 1999). No further evidence found.	M	L
Community Habitat			
Question	Comments	Rating	Confidence
Impact on composition High value EVC	EVC=Plains Grassy Woodland (V); CMA=Wimmera; Bioregion=Greater Grampians; VH CLIMATE potential. Invasion of natural areas by this species appears only to have occurred in Australia (AVH, 2006) and is currently not having a significant impact on the vegetation (Groves et al, 2003). As a shrub to around 1m (Hosking et al, 2003), at current sparse infestation levels (Turner & Conran, 2004), this species would cause very little displacement.	L	H
Impact on composition Medium value EVC	EVC=Sand Heathland (R); CMA=Glenelg-Hopkins; Bioregion=Glenelg Plain; VH CLIMATE potential. Invasion of natural areas by this species appears only to have occurred in Australia (AVH, 2006) and is currently not having a significant impact on the vegetation (Groves et al, 2003). As a shrub to around 1m (Hosking et al, 2003), at current sparse infestation levels (Turner & Conran, 2004), this species would cause very little displacement.	L	H

Department of Primary Industries Weed Assessment Record

Scientific Name: *Erica glandulosa*

Common Name:

Community Habitat			
Question	Comments	Rating	Confidence
Impact on composition Low value EVC	EVC=Heathy Woodland (LC); CMA=Wimmera; Bioregion=Greater Grampians; VH CLIMATE potential. Invasion of natural areas by this species appears only to have occurred in Australia (AVH, 2006) and is currently not having a significant impact on the vegetation (Groves et al, 2003). As a shrub to around 1m (Hosking et al, 2003), at current sparse infestation levels (Turner & Conran, 2004), this species would cause very little displacement.	L	M
Impact on structure?	Recorded as "naturalised and known to be a minor problem warranting control at 3 or fewer locations within a State or Territory" (Groves et al, 2003). Naturalised population in Australia consists of 67 mature individuals in small groups of 2-5 plants over about 1000 sq. m (Turner & Conran, 2004). Grows to around 1m high (Hosking et al, 2003). Not appearing to currently have a significant impact.	L	H
Effect on threatened flora?	No data found.	MH	L
Fauna			
Question	Comments	Rating	Confidence
Effect on threatened fauna?	No data found.	MH	L
Effect on non-threatened fauna?	No data found.	M	L
Benefits fauna?	Appears to provide some nectar to New Holland Honeyeater birds (Turner & conran, 2004). "Young birds can shelter under the plants" (Underhill, 1931).	MH	H
Injurious to fauna?	"None of our [South African] heath species possess injurious properties," (Marloth, 1932).	L	H
Pest Animal			
Question	Comments	Rating	Confidence
Food source to pests?	"Young tips of heathers are useful as food...for cattle, ponies, sheep, lambs, deer and grouse" (Underhill, 1931).	ML	M
Provides harbor?	"Young birds can shelter under the plants" (Underhill, 1931).	ML	M
Agriculture			
Question	Comments	Rating	Confidence
Impact yield?	E. glandulosa recognised as a potential environmental weed but was "not given a rating as an agricultural weed, either because it was not considered a problem or because it was not known to occur in agricultural areas at present" (Groves et al, 2003).	L	H
Impact quality?	E. glandulosa recognised as a potential environmental weed but was "not given a rating as an agricultural weed, either because it was not considered a problem or because it was not known to occur in agricultural areas at present" (Groves et al, 2003).	L	H

Department of Primary Industries Weed Assessment Record

Scientific Name: *Erica glandulosa*

Common Name:

Agriculture			
Question	Comments	Rating	Confidence
Affect land value?	E. glandulosa recognised as a potential environmental weed but was “not given a rating as an agricultural weed, either because it was not considered a problem or because it was not known to occur in agricultural areas at present” (Groves et al, 2003).	L	H
Change land use?	E. glandulosa recognised as a potential environmental weed but was “not given a rating as an agricultural weed, either because it was not considered a problem or because it was not known to occur in agricultural areas at present” (Groves et al, 2003).	L	H
Increase harvest costs?	E. glandulosa recognised as a potential environmental weed but was “not given a rating as an agricultural weed, either because it was not considered a problem or because it was not known to occur in agricultural areas at present” (Groves et al, 2003).	L	H
Disease host/vector?	E. glandulosa recognised as a potential environmental weed but was “not given a rating as an agricultural weed, either because it was not considered a problem or because it was not known to occur in agricultural areas at present” (Groves et al, 2003).	L	H
Impact Score			0.1399

Present distribution of *Erica glandulosa* in Victoria

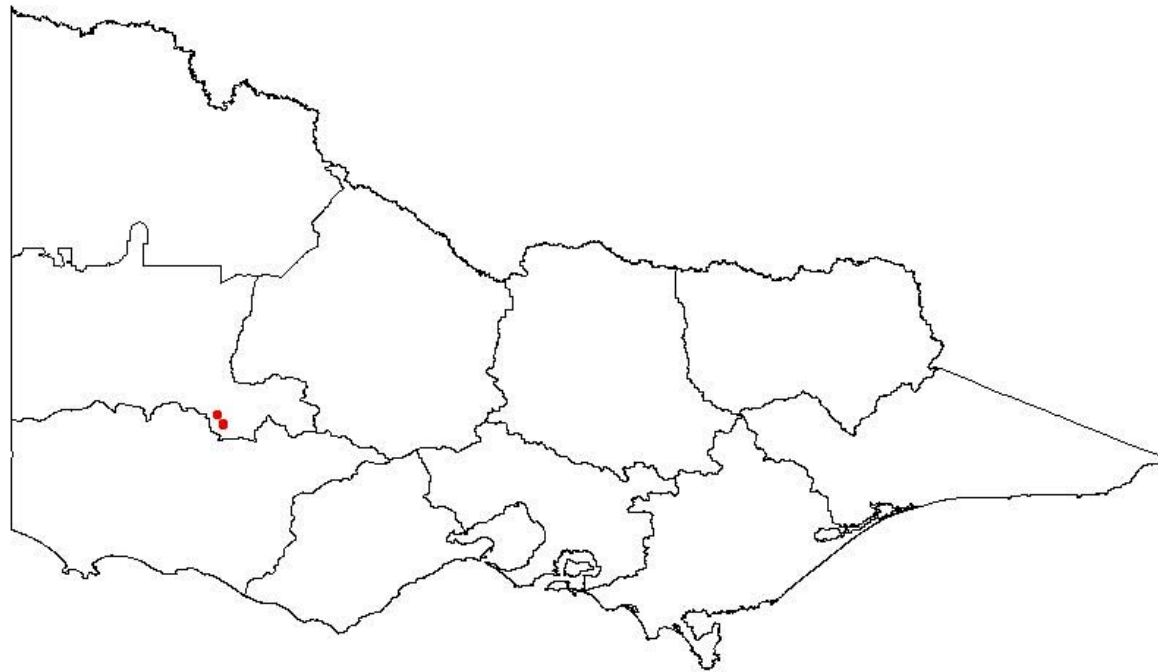
Scientific name: *Erica glandulosa* Thunb.

Common name(s):

Status:

Habitat:

Native to Southern Africa. Full-sun to semi shade. Sandy soil (Blood 2003). Found in coastal fynbos; flats and lower mountain slopes; disturbed shrubby Eucalyptus- angophora woodland.



Potential distribution of *Erica glandulosa* in Victoria

Scientific name: *Erica glandulosa* Thunb.

Common name(s):

Status:

Habitat:

Native to Southern Africa. Full-sun to semi shade. Sandy soil (Blood 2003). Found in coastal fynbos; flats and lower mountain slopes; disturbed shrubby Eucalyptus- angophora woodland.

Potential distribution produced from CLIMATE modelling refined by applying suitable landuse and vegetation type overlays with CMA boundaries

MAP OVERLAYS USED.

Land Use:

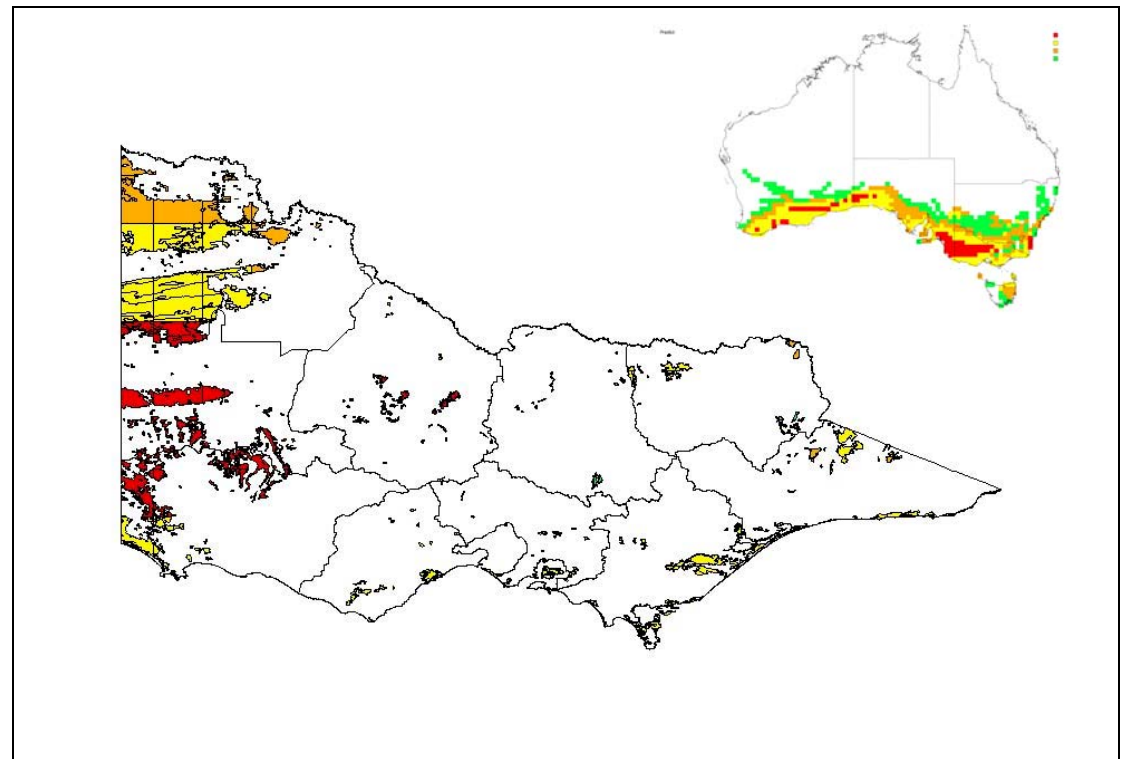
Broad vegetation types

Coastal scrubs and grassland; coastal grassy woodland; heathy woodland; heath; inland slopes woodland; montane dry woodland; grassland; plains grassy woodland; montane grassy woodland; rainshadow woodland; mallee; mallee heath; boinka-raak; mallee woodland; Wimmera/mallee woodland.

Colours indicate possibility of *Erica glandulosa* infesting these areas.

 Red	= Very high	 Yellow	= High
 Orange	= Medium	 Green	= Likely

In the non-coloured areas the plant is unlikely to establish as the climate, soil or landuse is not presently suitable.



Department of Primary Industries Weed Assessment Record

Scientific Name: *Euphorbia cyparissias*

Common Name: cypress spurge

Invasiveness

Establishment			
Question	Comments	Rating	Confidence
Germination requirements?	'New shoots emerge soon after the snow cover melts in the spring' (Stahevitch et al 1988). In Ontario 'seeds germinate from mid- to late May'. Studies have shown that 'germination was very low (4-8%) if temperatures were kept constant' (Stahevitch et al 1988). Requires natural seasonal disturbances.	MH	H
Establishment requirements?	Generally doesn't occur 'on intensively cultivated soils or on heavily forested ones...the tetraploid appears to be more shade tolerant than the fertile diploid' (Stahevitch et al 1988). In Ontario, 'tetraploid colonies occur more frequently on wooded sites than do sterile diploid ones'. In fertile diploid plants, seedlings 'can not become established in dense grass cover .. restricted to sites with patchy ground cover'. Can establish under moderate canopy.	MH	H
How much disturbance is required?	In North America, typically found 'on open ground used for pasture'. In Europe, 'found in dry to moderately moist meadows, pastures, alpine meadows, dry heaths, in sparse woods, along forest edges, grassy hills, and stream banks. Also found in man-made habitats including railway embankments, roadside cuts, cemeteries, gardens and vineyards' (Stahevitch et al 1988). Can establish in relatively intact natural ecosystem.	MH	M

Growth/Competitive			
Question	Comments	Rating	Confidence
Life form?	Semi-woody perennial forb. Life form – other. Rhizomatous	L	H
Allelopathic properties?	None described	L	H
Tolerates herb pressure?	The latex 'is strongly irritating and consequently affords protection against grazing'. 'The latex of <i>E. cyparissias</i> is generally effective in repelling insect attacks.' Some insects have adapted to the plant and attempts have been made to find effective biocontrol agent (Stahevitch et al 1988). 'Preference was given to root-feeding chrysomelid beetles in the genus <i>Aphthona</i> .' 'Sheep can browse the plant with no ill effects' (Faubert & Casagrande 2002). Consumed (sheep) but non-preferred.	MH	MH
Normal growth rate?	Perennial plant that can reproduce rapidly (CNAP 2000). However, insufficient information to determine rate of growth. Therefore score as medium.	M	L
Stress tolerance to frost, drought, w/logg, sal. etc?	Plant overwinters. (Stahevitch et al 1988). Fire tolerant (Jordan et al 2002). Tolerates drought: no Water: dry (Crescent Bloom 2004). Tolerant to at least 2 and susceptible to at least 2.	ML	MH

Reproduction			
Question	Comments	Rating	Confidence
Reproductive system	The root system 'is the only means of propagation available to the sterile diploid, and a supplementary mode for the fertile diploids and tetraploids' (Stahevitch et al 1988). In North America, only tetraploid plants produce seed; all diploids are sterile but a fertile diploid cytotype is known from Europe'. Tetraploid capable of both vegetative and sexual reproduction.	H	H

Department of Primary Industries Weed Assessment Record

Scientific Name: *Euphorbia cyparissias*

Common Name: cypress spurge

Reproduction			
Question	Comments	Rating	Confidence
Number of propagules produced?	'Individual tetraploid plants may produce between 30 –900 or more seeds' (Stahevitch et al 1988). 50 – 1000 propagules produced per flowering event.	ML	H
Propagule longevity?	Salisbury (cited in Stahevitch et al 1988) 'reported germination rates of 85% in <i>E. cyparissias</i> . Other studies report considerably less success.' 'Seeds remain viable in the soil for 1 to 5 years' (USGS 2005). Seeds survive less than 5 years.	L	H
Reproductive period?	'Tends to form almost pure stands at open sites and is likely to be responsible for displacement of native species' (Faubert & Casagrande 2002). Life span: 3 – 10 years (Crescent Bloom 2004). Species has the ability to form self-sustaining dense monocultures.	H	MH
Time to reproductive maturity?	Seeds germinate each spring, flowering begins first or second week of May .. seeds may mature as early as the third week in June .. second flowering often occurs in late flower or early fall[northern hemisphere] (CNAP 2000). Reaches maturity and produces viable propagules in under a year.	H	MH
Dispersal			
Question	Comments	Rating	Confidence
Number of mechanisms?	'The fruit of the fertile form is an explosive capsule that splits open when mature and throws its seed up to five metres' (Faubert & Casagrande 2002). Propagules mainly spread by gravity.	L	MH
How far do they disperse?	'The fruit of the fertile form is an explosive capsule that splits open when mature and throws its seed up to five metres' (Faubert & Casagrande 2002). 'Dispersal ability: little potential for long-distance dispersal' (USGS 2005). Very unlikely to disperse greater than 200m but most will be less than 20m.	L	MH
Invasiveness Score			0.4309

Department of Primary Industries Weed Assessment Record

Scientific Name: *Euphorbia cyparissias*

Common Name: cypress spurge

Impact

Social			
Question	Comments	Rating	Confidence
Restrict human access?	Can grow up to 80cm but average is 50cm. Forms dense stands. All parts of the plant contain a 'toxic latex that irritates the eyes, mouth and gastrointestinal tract and causes dermatitis upon contact in some people' (Faubert & Casagrande 2002). 'Found in dry to moderately moist meadows, pastures, alpine meadows, dry heaths, in sparse woods, along forest edges, grassy hills, and stream banks.' Possible that the weed would have a low nuisance area in some places it is found.	ML	MH
Reduce tourism?	Flower from late spring and may continue until late autumn. Forms dense stands with yellowish-green flowers on a many-branched umbel. (OMAF 2005). Weed would not be obvious to average visitor.	L	MH
Injurious to people?	'The latex, which is present in all parts of the plant, produces dermatitis and blisters in susceptible individuals' (Stahevitch et al 1988). All parts of the plant contain a 'toxic latex that irritates the eyes, mouth and gastrointestinal tract and causes dermatitis upon contact in some people' (Faubert & Casagrande 2002). Toxic properties at most times of the year.	MH	H
Damage to cultural sites?	Flower from late spring and may continue until late autumn. Forms dense stands with yellowish-green flowers on a many-branched umbel. (OMAF 2005). However, little or negligible effect on aesthetics or structure of site.	L	MH
Abiotic			
Question	Comments	Rating	Confidence
Impact flow?	Terrestrial species	L	H
Impact water quality?	Terrestrial species	L	H
Increase soil erosion?	The vertical taproot can be up to 3m long 'giving rise to short, horizontal laterals which are short-lived and determinate' (Stahevitch et al 1988). Plant overwinters. 'Tends to form almost pure stands at open sites and is likely to be responsible for displacement of native species' (Faubert & Casagrande 2002). Low probability of large-scale soil movement.	L	H
Reduce biomass?	'Tends to form almost pure stands at open sites and is likely to be responsible for displacement of native species' (Faubert & Casagrande 2002). In these situations, biomass may increase.	L	MH
Change fire regime?	Herbaceous perennial (Faubert & Casagrande 2002). Likely to have small or negligible effect on fire risk.	L	MH
Community Habitat			
Question	Comments	Rating	Confidence
Impact on composition High value EVC	EVC=Plains grassy woodland (BCS = E.); CMA=Corangamite; Bioreg=Victorian volcanic plain; CLIMATE potential=VH. 'Tends to form almost pure stands at open sites and is likely to be responsible for displacement of native species' (Faubert & Casagrande 2002). Major displacement of some dominant species within a layer.	MH	MH

Department of Primary Industries Weed Assessment Record

Scientific Name: *Euphorbia cyparissias*

Common Name: cypress spurge

Community Habitat			
Question	Comments	Rating	Confidence
Impact on composition Medium value EVC	EVC=Shallow sands woodland (BCS = D); CMA=Wimmera; Bioreg=Lowan Mallee; CLIMATE potential=VH. 'Tends to form almost pure stands at open sites and is likely to be responsible for displacement of native species' (Faubert & Casagrande 2002). Major displacement of some dominant species within a layer.	MH	MH
Impact on composition Low value EVC	EVC=Montane dry woodland (BCS = LC); CMA=North East; Bioreg=Northern Inland Slopes; CLIMATE potential=VH. 'Tends to form almost pure stands at open sites and is likely to be responsible for displacement of native species' (Faubert & Casagrande 2002). Major displacement of some dominant species within a layer.	MH	MH
Impact on structure?	'Under certain conditions cypress spurge may become the dominant species on a site to the exclusion of valuable forage and native plants. For example, on lightly grazed pasture [in Canada] E. cyparissias comprised 26% of the vegetation in wet summers and 56% in dry ones' (Stahevitch et al 1988). 'Tends to form almost pure stands at open sites and is likely to be responsible for displacement of native species' (Faubert & Casagrande 2002). Major effect on less than 60% of the floral strata.	MH	H
Effect on threatened flora?	This species is not documented as posing an additional risk to threatened flora.	MH	L
Fauna			
Question	Comments	Rating	Confidence
Effect on threatened fauna?	This species is not documented as posing an additional risk to threatened fauna.	MH	L
Effect on non-threatened fauna?	Species not documented to have an effect on non-threatened fauna species.	L	MH
Benefits fauna?	Species not documented to provide benefits or facilitate the establishment of indigenous fauna.	H	MH
Injurious to fauna?	'Any animal consuming spurge or coming in contact with the sap may be affected' (Goetz et al 2000). Usually 'cattle avoid grazing on cypress spurge, but those which accidentally ingest the plant may develop scours, collapse and eventually die' (Stahevitch et al 1988). Toxic.	H	H
Pest Animal			
Question	Comments	Rating	Confidence
Food source to pests?	Weed not documented to provide a food source to pest animals.	L	H
Provides harbor?	Weed not documented to provide harbour for pest species.	L	H
Agriculture			
Question	Comments	Rating	Confidence
Impact yield?	'It does not tolerate intensive cultivation and is not a problem in crops (CNAP 2000). More of a problem in pastures but no documented evidence to show that the quantity of produce is affected.	L	MH

Department of Primary Industries Weed Assessment Record

Scientific Name: *Euphorbia cyparissias*

Common Name: cypress spurge

Agriculture		Rating	Confidence
Question	Comments		
Impact quality?	E. cyparissias can affect taste and smell of milk. Can also make the milk reddish. (Richter 1965). Minor impact on the quality of produce.	MH	M
Affect land value?	Although cypress spurge is found throughout much of North America, economic losses are primarily restricted to the northeastern United States. 'Reduces the forage value of pastures, contaminates hayfields' 'At one site in Rhode Island, approximately 70 out of 170 acres of hay meadow were dominated by cypress spurge, making most of the land unfit for cattle and growing hay' (Faubert & Casagrande 2002). Possible that land value would decrease by less than 10%.	M	MH
Change land use?	'At one site in Rhode Island, approximately 70 out of 170 acres of hay meadow were dominated by cypress spurge, making most of the land unfit for cattle and growing hay' (Faubert & Casagrande 2002). Weed may lead to downgrading of the priority land use.	MH	MH
Increase harvest costs?	'Control of Euphorbia cyparissias is difficult to achieve because of its extensive root system and highly efficient seed dispersal. Repeated applications of several chemicals bring about its control' (Stahevitch et al 1988). In pastures and hayfields, more time and labour would be required.	M	H
Disease host/vector?	Host of the rust Uromyces striatus Schroet (infects both diploid and tetraploid cytotypes of E. cyparissias through the rhizome buds) which occurs on lucerne, medics and sweet clover (Stahevitch et al 1988, Clarke 1999). Provides host to minor disease.	M	H
		Impact Score	0.4039

Present distribution of *Euphorbia cyparissias* in Victoria

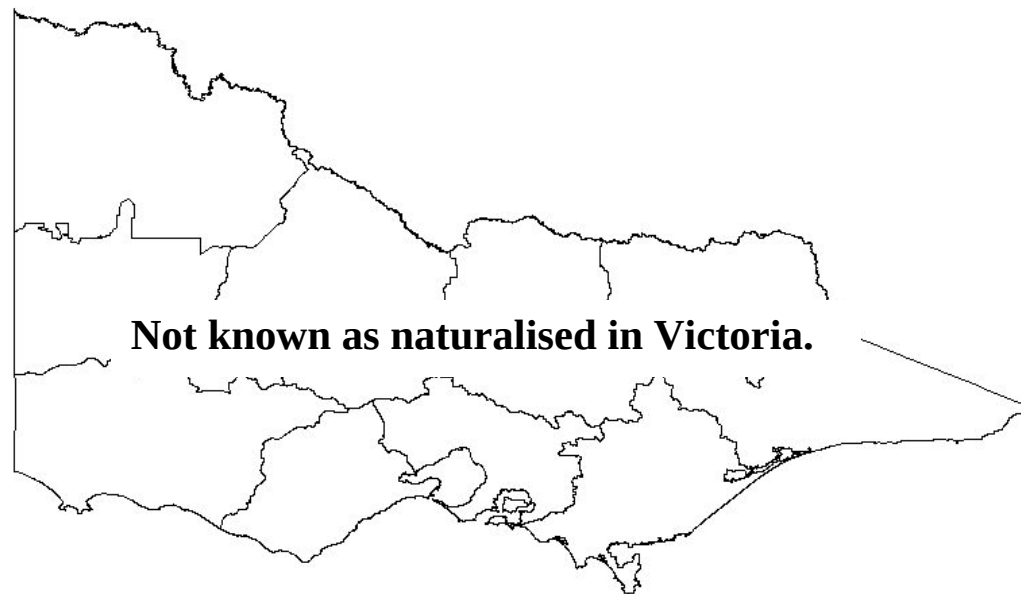
Scientific name: *Euphorbia cyparissias* L.

Common name(s): cypress spurge

Status:

Habitat:

In North America typically found in open ground used for pasture, often with a sandy or limestone substrate. Species of light sands, sandy loams, and gravels. Found in both warm temperate and snow climates with equitable precipitation. Occupies altitudinal gradient from lowlands to alpine zone. In Europe, found in dry to moderately moist meadows, pastures, alpine meadows, dry heaths, in sparse woods, along forest edges, grassy hills, and stream banks. Also found in man-made habitats including railway embankments, roadside cuts, cemeteries, gardens and vineyards. (Stahevitch *et al* 1988).



Potential distribution of *Euphorbia cyparissias* in Victoria

Scientific name: *Euphorbia cyparissias* L.

Common name(s): cypress spurge

Status:

Habitat:

In North America typically found in open ground used for pasture, often with a sandy or limestone substrate. Species of light sands, sandy loams, and gravels. Found in both warm temperate and snow climates with equitable precipitation. Occupies altitudinal gradient from lowlands to alpine zone. In Europe, found in dry to moderately moist meadows, pastures, alpine meadows, dry heaths, in sparse woods, along forest edges, grassy hills, and stream banks. Also found in man-made habitats including railway embankments, roadside cuts, cemeteries, gardens and vineyards. (Stahevitch *et al* 1988).

Potential distribution produced from CLIMATE modelling refined by applying suitable landuse and vegetation type overlays with CMA boundaries

MAP OVERLAYS USED.

Land Use:

Pasture dryland

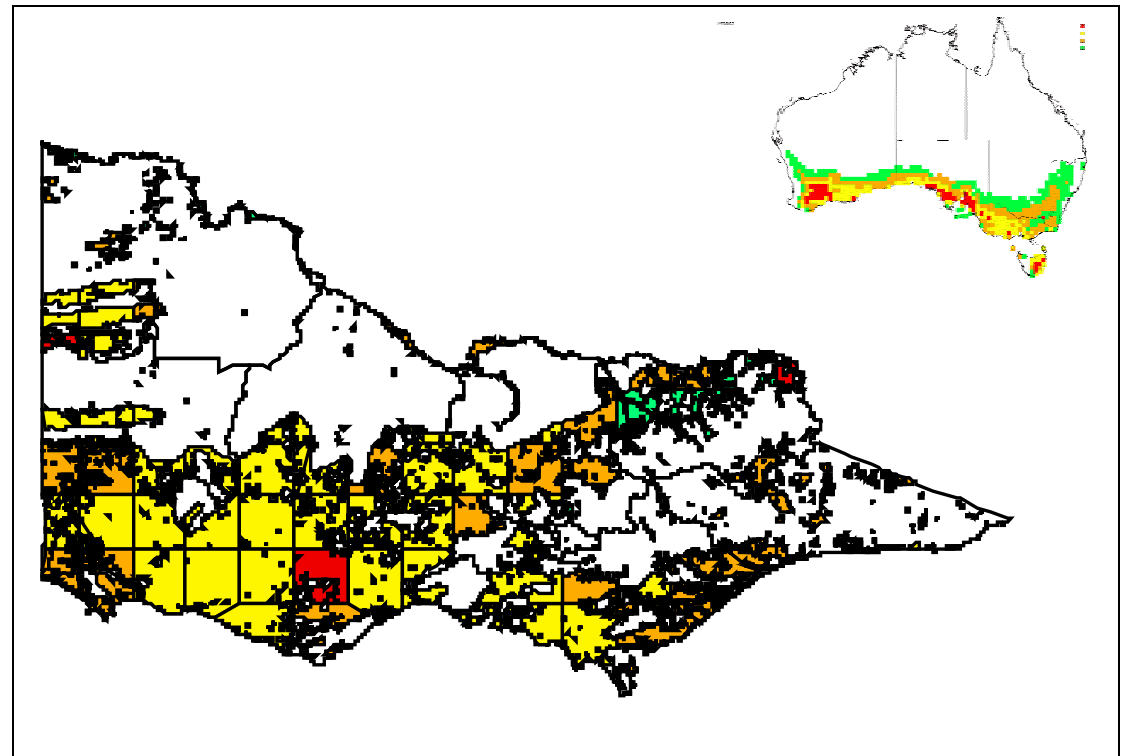
Broad vegetation types

Heathy woodland; heath; grassland; plains grassy woodland; sub-alpine grassy woodland; montane grassy woodland; riverine grassy woodland; mallee heath; boinka-raak; mallee woodland; wimmera / mallee woodland

Colours indicate possibility of *Euphorbia cyparissias* infesting these areas.

Red	= Very high	Yellow	= High
Orange	= Medium	Green	= Likely

In the non-coloured areas the plant is unlikely to establish as the climate, soil or landuse is not presently suitable.



Department of Primary Industries Weed Assessment Record

Scientific Name: *Gunnera tinctoria*

Common Name: Chilean rhubarb

Invasiveness

Establishment			
Question	Comments	Rating	Confidence
Germination requirements?	In New Zealand studies, observations 'suggest that germination and seedling emergence occurs from spring right through summer' (Williams et al 2005). Requires natural seasonal temperatures for germination.	MH	MH
Establishment requirements?	'Requires moist soils in order to establish' (ISSG 2005). Is shade-tolerant. Requires more specific requirements to establish.	ML	MH
How much disturbance is required?	Found in 'meadows, bogs, gardens, woodlands, sunny edges, and dappled shade' also on 'coastal cliffs, riparian zones and wetland areas' (ISSG 2005). Establishes in minor disturbed natural ecosystems.	MH	MH

Growth/Competitive			
Question	Comments	Rating	Confidence
Life form?	Over-wintering buds which accumulate on the rhizomes (Williams et al 2005). Herb. Life form – geophyte.	ML	MH
Allelopathic properties?	None described.	L	MH
Tolerates herb pressure?	'Unpalatable to stock because of its barbs (ISSG 2005). Although, studies in New Zealand found leaves browsed by cattle and observations showed 'lack of seedlings in pasture .. suggesting that grazing limits Chilean rhubarb's encroachment into pasture' (Williams et al 2005). Inconclusive. Score medium.	M	L
Normal growth rate?	'Once established, vegetative growth can be rapid with rhizomes increasing by up to 15cm annually' (ISSG 2005). Moderately rapid growth.	MH	MH
Stress tolerance to frost, drought, w/ogg, sal. etc?	'Nil to moderate annual water deficit'. 'Intolerance of low temperatures' but 'shoots are dormant under winter conditions' (Williams et al 2005). 'Tolerates salt spray and found growing right up to the high tide mark in coastal areas' 'Tolerate seasonally water logged wet soils' (ISSG 2005). Fire can be used as control method if rhizomes are dug out. (TRC n.d.). Tolerant to at least 2 and susceptible to at least 2.	ML	MH

Reproduction			
Question	Comments	Rating	Confidence
Reproductive system	Produces both sexually and vegetatively (Williams et al 2005).	H	MH
Number of propagules produced?	'Each seed head may contain in excess of 80,000 seeds' (ISSG 2005). Above 2000.	H	MH
Propagule longevity?	In germination tests in New Zealand, two different experiments achieved '100% germination within 30 days' (Williams et al 2005). No evidence to support the seed bank surviving greater than five years.	L	MH
Reproductive period?	'Forms dense colonies' (ISSG 2005).	H	MH

Department of Primary Industries Weed Assessment Record

Scientific Name: *Gunnera tinctoria*

Common Name: Chilean rhubarb

Reproduction			
Question	Comments	Rating	Confidence
Time to reproductive maturity?	In New Zealand in cool, moist conditions the plant 'took three years to reach tall stature and appeared to flower only after four or five years' (Williams et al 2005). Reaches productive maturity in 2-5 years.	L	MH
Dispersal			
Question	Comments	Rating	Confidence
Number of mechanisms?	'Seeds are spread mainly by birds and along watercourses' (ISSG 2005). Bird dispersed seed.	H	MH
How far do they disperse?	'Seeds are spread mainly by birds and along watercourses' (ISSG 2005). Very likely that some propagules will disperse greater than 1km.	H	MH
Invasiveness Score			0.6208

Department of Primary Industries Weed Assessment Record

Scientific Name: *Gunnera tinctoria*

Common Name: Chilean rhubarb

Impact

Social			
Question	Comments	Rating	Confidence
Restrict human access?	'..large, clump-forming, herbaceous plant that grows up to 2m in height...The leaves and their stems are covered in rubbery prickles' (ISSG 2005). 'Can obstruct access to natural and recreational areas'. Plant has potential to impede individual access.	ML	MH
Reduce tourism?	'..large, clump-forming, herbaceous plant that grows up to 2m in height...exotic tropical appearance' 'Can obstruct access to natural and recreational areas'. Found on 'coastal cliffs, riparian zones and wetland areas' (ISSG 2005). Some recreational uses requiring access to waterways may be affected.	MH	MH
Injurious to people?	'The leaves and their stems are covered in rubbery prickles' (ISSG 2005). Plant has potential to cause some physiological issues.	ML	MH
Damage to cultural sites?	No evidence that the plant would cause damage to cultural sites.	L	MH
Abiotic			
Question	Comments	Rating	Confidence
Impact flow?	'Can block drains and streams' (DOC 2003). Although plant is not an aquatic, it does grow near waterways and may have minor impact on surface flow.	ML	M
Impact water quality?	No evidence that the plant has an effect on water quality. Terrestrial species (Williams et al 2005).	L	MH
Increase soil erosion?	Can form dense-infestations. 'In areas with harsh winter frosts, G. tinctorial is deciduous or semi-deciduous'. Found on 'coastal cliffs, riparian zones and wetland areas' and can 'form dense infestations' (ISSG 2005). Although not documented, there are some instances where soil would be exposed which may lead to a moderate probability of large scale soil movement.	ML	M
Reduce biomass?	In Ireland it was found that 'biomass production was .. four times higher than other species from comparable grassland areas' (Williams et al 2005). Biomass may increase.	L	MH
Change fire regime?	In Ireland it was found that 'biomass production was .. four times higher than other species from comparable grassland areas' (Williams et al 2005). Plant can grow up to 2m and dies off in winter in extreme temperatures. However, grows predominantly in riparian zones and wetland areas so small or negligible effect on fire risk.	L	MH
Community Habitat			
Question	Comments	Rating	Confidence
Impact on composition High value EVC	EVC=Clay heathland (BCS status = V); CMA=East Gippsland; Bioreg=East Gippsland Lowlands; CLIMATE potential=VH. 'Forms dense colonies that shade out and suppress native vegetation' (ISSG 2005). Major displacement of some dominant spp. within the lower strata.	MH	MH

Department of Primary Industries Weed Assessment Record

Scientific Name: *Gunnera tinctoria*

Common Name: Chilean rhubarb

Community Habitat			
Question	Comments	Rating	Confidence
Impact on composition Medium value EVC	EVC=Coastal saltmarsh (BCS status = D); CMA=East Gippsland; Bioreg=East Gippsland Lowlands; CLIMATE potential=VH. 'Forms dense colonies that shade out and suppress native vegetation' (ISSG 2005). Major displacement of some dominant spp. within the lower strata.	MH	MH
Impact on composition Low value EVC	EVC=Wet heathland (BCS status = LC); CMA=East Gippsland; Bioreg=East Gippsland Lowlands; CLIMATE potential=VH. 'Forms dense colonies that shade out and suppress native vegetation' (ISSG 2005). Major displacement of some dominant spp. within the lower strata.	MH	MH
Impact on structure?	In meadows 'after invasion, the grasses and rushes lose dominance' (Williams et al 2005). In NZ it has replaced grey willow thus altering 'the process of natural vegetation succession' 'Forms dense colonies that shade out and suppress native vegetation' (ISSG 2005).Major effect on lower strata.	MH	MH
Effect on threatened flora?	'Shades out rare and endangered indigenous flora and fauna' (ISSG 2005). 'Can impact on a disproportionately large number of the comparatively small, native herbs'. However, in Victoria, this species is not documented as posing an additional risk to threatened flora.	MH	L
Fauna			
Question	Comments	Rating	Confidence
Effect on threatened fauna?	'Shades out rare and endangered indigenous flora and fauna' (ISSG 2005). However, in Victoria, this species is not documented as posing an additional risk to threatened fauna.	MH	L
Effect on non-threatened fauna?	In NZ, staff of DOC and land-owners 'have been concerned with the fate of ..the geckos, skinks and seabirds that inhabit coastal areas' (DOC 2003). Minor reduction in habitat/food/shelter.	ML	M
Benefits fauna?	In New Zealand 'blackbird and white-eye have been observed eating the fruit' (Williams et al 2005). Provides some assistance in food to desirable species.	M	MH
Injurious to fauna?	'Unpalatable to stock because of its barb's (ISSG 2005). Insufficient information to determine the extent to which the barbs affect indigenous fauna. Score medium.	M	L
Pest Animal			
Question	Comments	Rating	Confidence
Food source to pests?	In New Zealand 'blackbird and white-eye have been observed eating the fruit' (Williams et al 2005). Possible that the plant may be a food source to pest species.	ML	MH
Provides harbor?	Plant not documented to provide harbour to pest species.	L	MH
Agriculture			
Question	Comments	Rating	Confidence

Department of Primary Industries Weed Assessment Record

Scientific Name: *Gunnera tinctoria*

Common Name: Chilean rhubarb

Agriculture			
Question	Comments	Rating	Confidence
Impact yield?	Can be found in damp pastures (Osborne et al 1991). In meadows 'after invasion, the grasses and rushes lose dominance' (Williams et al 2005). Minor impact on quantity of produce.	ML	MH
Impact quality?	Plant not documented to impact upon agricultural quality.	L	MH
Affect land value?	Although it can form dense infestations it can be treated with chemicals (Williams et al 2005). Plant not documented to affect land value.	L	MH
Change land use?	'Young Chilean rhubarb can be readily killed with chemicals' (Williams et al 2005). No evidence to suggest that weed would cause a change in priority of land use.	L	MH
Increase harvest costs?	Can be found in damp pastures (Osborne et al 1991). In meadows 'after invasion, the grasses and rushes lose dominance' (Williams et al 2005). 'Young Chilean rhubarb can be readily killed with chemicals' (Williams et al 2005). May be a minor increase in time and labour associated with pastures.	M	MH
Disease host/vector?	Not documented to be a host or vector for disease of agriculture.	L	MH
Impact Score			0.3490

Present distribution of *Gunnera tinctoria* in Victoria

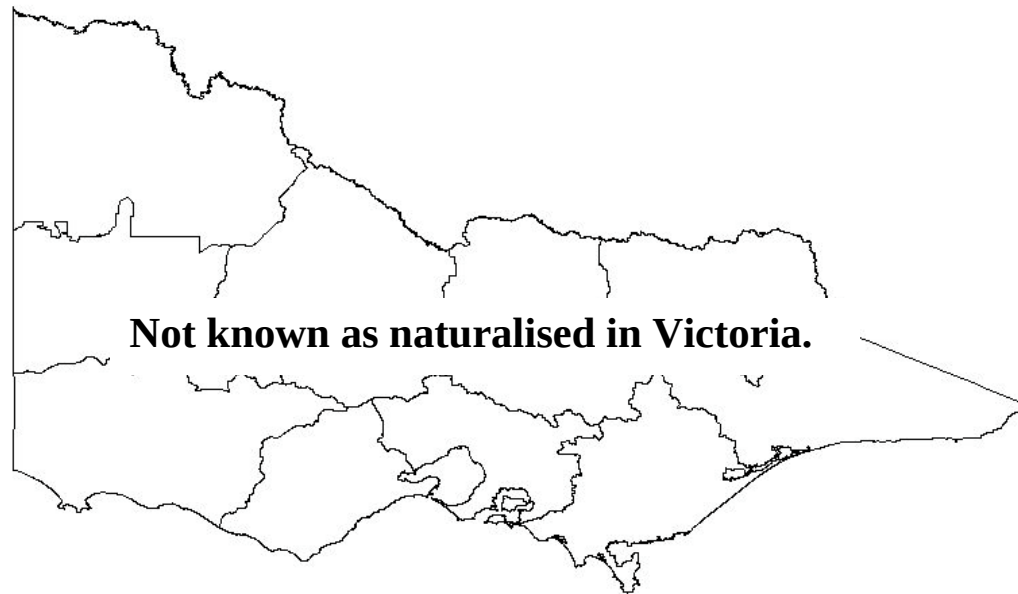
Scientific name: *Gunnera tinctoria* (Molina) Mirb.

Common name(s): Chilean rhubarb

Status:

Habitat:

Native to South America. Occurs in coastland, estuaries, lakes, marine habitats, natural forest, riparian zones, water courses, wetlands. Been found in meadows, bogs, gardens, woodlands, sunny edges, and dappled shade. Requires moist soils and grows on substrates derived from a wide range of sedimentary rocks (ISSG 2005).



Potential distribution of *Gunnera tinctoria* in Victoria

Scientific name: *Gunnera tinctoria* (Molina) Mirb.

Common name(s): Chilean rhubarb

Status:

Habitat:

Native to South America. Occurs in coastland, estuaries, lakes, marine habitats, natural forest, riparian zones, water courses, wetlands. Been found in meadows, bogs, gardens, woodlands, sunny edges, and dappled shade. Requires moist soils and grows on substrates derived from a wide range of sedimentary rocks (ISSG 2005).

Potential distribution produced from CLIMATE modelling refined by applying suitable landuse and vegetation type overlays with CMA boundaries

MAP OVERLAYS USED.

Land Use:

Forest private plantation; forest public plantation; horticulture;
pasture irrigation

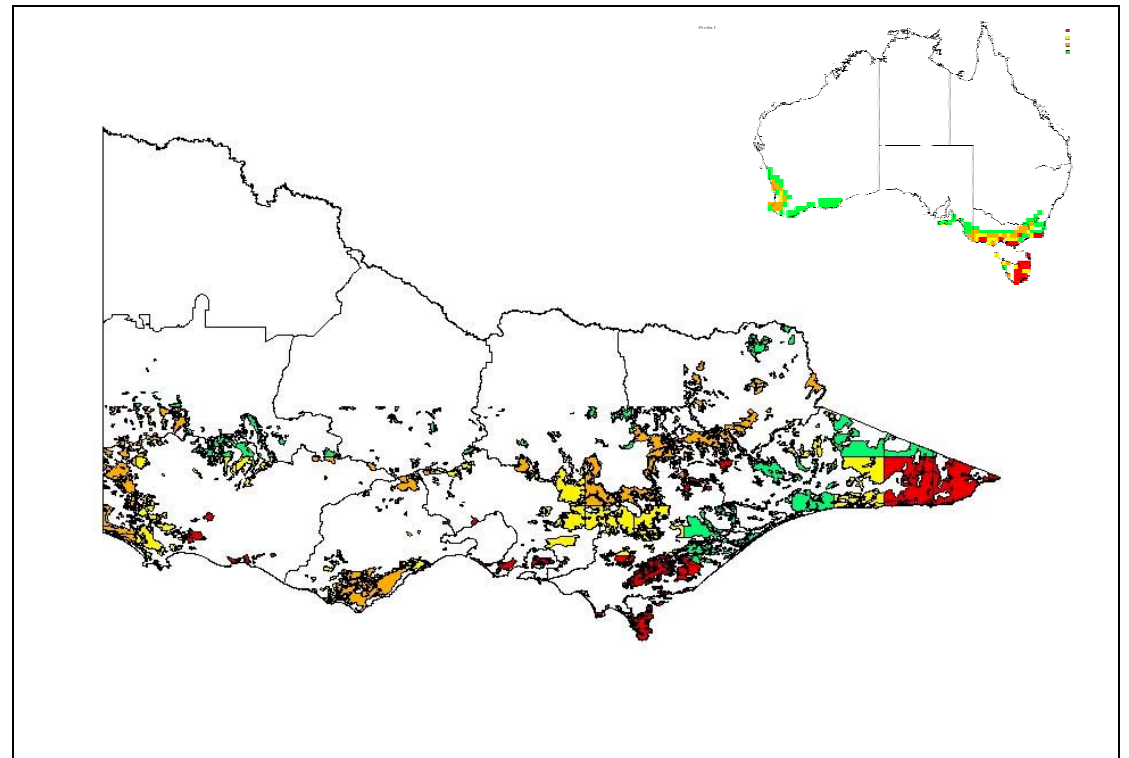
Broad vegetation types

Coastal scrubs and grassland; coastal grassy woodland; heathy woodland; lowland forest; heath; swamp scrub; inland slopes woodland; sedge-rich woodland; moist foothill forest; grassland; plains grassy woodland; valley grassy forest; herb-rich woodland; riverine grassy woodland; riparian forest; rainshadow woodland

Colours indicate possibility of infesting these areas.

Red	= Very high	Yellow	= High
Orange	= Medium	Green	= Likely

In the non-coloured areas the plant is unlikely to establish as the climate, soil or landuse is not presently suitable.



Department of Primary Industries Weed Assessment Record

Scientific Name: *Gymnocoronis spilanthoides*

Common Name: Senegal tea plant

Invasiveness

Establishment			
Question	Comments	Rating	Confidence
Germination requirements?	"Fragments quickly develop adventitious roots and new stems when they come to rest, forming new colonies".	H	M
Establishment requirements?	"It grows fast and makes few demands, but it does require a lot of light".	ML	M
How much disturbance is required?	Established in minor disturbed ecosystems (e.g. wetlands, riparian).	MH	M

Growth/Competitive			
Question	Comments	Rating	Confidence
Life form?	"A freshwater or marsh-growing emergent perennial herb".	H	M
Allelopathic properties?	No Allelopathic properties described.	L	M
Tolerates herb pressure?	"It has no agricultural value as a stock food".	MH	M
Normal growth rate?	"Senegal tea plant is an extremely hardy plant with a growth rate exceeding 15cm a week in fertile situations".	H	M
Stress tolerance to frost, drought, w/logg, sal. etc?	Tolerant of water logging, (emergent herb). May tolerate drought/fire in an aquatic situation (?).	ML	M

Reproduction			
Question	Comments	Rating	Confidence
Reproductive system	Reproducing vegetatively and by seed.	H	M
Number of propagules produced?	High seed productivity not mentioned as a 'property' by P & C (1992). Plant varies in size – 30-60cm high & 10-20cm wide (Tropica d/base 2001): stems up to 2.5m in height (Dept Lands Brisbane n.d.). estimate from description, illustrations and? 40 flowers per plant x 100 florets per flowering head x 1 seed per floret = 4,000 seeds per plant.	H	M
Propagule longevity?	Unknown.	M	M
Reproductive period?	Forms dense mats that quickly cover the water surface ? monoculture.	H	M
Time to reproductive maturity?	Seeds germinate in spring – flowering in late spring or early summer. However, plants forming from fragments could in turn produce fragments in < 1 year, especially at a growth rate of 15cm a week.	H	M

Department of Primary Industries Weed Assessment Record

Scientific Name: *Gymnocoronis spilanthoides*

Common Name: Senegal tea plant

Dispersal			
Question	Comments	Rating	Confidence
Number of mechanisms?	Seed – flowing water, or mud sticking to animal hooves. Fragments – streamflow.	MH	M
How far do they disperse?	“The seeds of Senegal Tea Plant are relatively heavy and not adapted for wind dispersal. The majority, in consequence, falls close to the parent plant and remains where they fall, or are dispersed by flowing water or mud sticking to animal hooves. Further spread occurs when stem fragments containing nodes are broken off and moved in streamflow”. However, as occurs in slow-flowing waters, long distance dispersal is unlikely.	L	M
Invasiveness Score			0.4630

Department of Primary Industries Weed Assessment Record

Scientific Name: *Gymnocoronis spilanthoides*

Common Name: Senegal tea plant

Impact

Social			
Question	Comments	Rating	Confidence
Restrict human access?	Stems from 1 to 1.5m long (Parsons & Cuthbertson 2001). '...commonly found as a scrambling form extending from the edge of waterways and forming dense tangled mats in open water' (CRC for Australian Weed Management 2003). Impedes individual access.	ML	MH
Reduce tourism?	'It impedes water flow, navigation and recreation' (Parsons & Cuthbertson 2001). Some recreational uses affected.	MH	MH
Injurious to people?	Plant not noted to be toxic or injurious to people (PIER 2001).	L	MH
Damage to cultural sites?	Semi-aquatic plant. Negligible effect on aesthetics of site.	L	MH
Abiotic			
Question	Comments	Rating	Confidence
Impact flow?	'Dense infestations impede water flow and growth of native plant species' (Weber 2003). '... effects of flooding are worse because infestations block drainage channels' (CRC for Australian Weed Management 2003). Major impact on surface or subsurface flow.	MH	MH
Impact water quality?	'Water quality may decline if large amounts of Senegal tea plant die off and rot under water' (CRC for Australian Weed Management 2003). Noticeable but minor effects in either dissolved oxygen or light levels.	ML	M
Increase soil erosion?	'Numerous, finely fibrous adventitious roots developing from the nodes'. Plants are dormant during winter. (Parsons & Cuthbertson 2001). Moderate probability of large scale soil movement.	ML	MH
Reduce biomass?	'.. can rapidly cover water bodies with a floating mat, excluding other plants' (CRC for Australian Weed Management 2003). Plants are dormant during winter (Parsons & Cuthbertson 2001). Biomass may increase at certain times of year.	L	MH
Change fire regime?	Semi-aquatic. Negligible effect on fire risk.	L	MH
Community Habitat			
Question	Comments	Rating	Confidence
Impact on composition High value EVC	Basin=Tambo River- Nicholson river (ISC=excellent); CMA=East Gippsland; CLIMATE=VH; Can rapidly cover water bodies with a floating mat, excluding other plants' (CRC for Australian Weed Management 2003). Displaces all species within a layer.	H	M
Impact on composition Medium value EVC	Aquatic species. All Victorian water bodies considered to comprise high value EVCs only (Weiss pers. coms.) .	L	H
Impact on composition Low value EVC	Aquatic species. All Victorian water bodies considered to comprise high value EVCs only (Weiss pers. coms.) .	L	H

Department of Primary Industries Weed Assessment Record

Scientific Name: *Gymnocoronis spilanthoides*

Common Name: Senegal tea plant

Community Habitat			
Question	Comments	Rating	Confidence
Impact on structure?	'.. can rapidly cover water bodies with a floating mat, excluding other plants' (CRC for Australian Weed Management 2003). Major effect on less than 60% of floral strata.	MH	M
Effect on threatened flora?	This species is not documented as posing an additional risk to threatened flora.	MH	L
Fauna			
Question	Comments	Rating	Confidence
Effect on threatened fauna?	This species is not documented as posing an additional risk to threatened fauna.	MH	L
Effect on non-threatened fauna?	'.. can rapidly cover water bodies with a floating mat, excluding other plants and the animals that rely on them' (CRC for Australian Weed management 2003). Minor reduction in habitat / food / shelter.	ML	M
Benefits fauna?	Weed not known to benefit or facilitate the establishment of indigenous fauna.	H	M
Injurious to fauna?	Plant is not toxic and does not have burrs or spines which affect indigenous fauna.	L	M
Pest Animal			
Question	Comments	Rating	Confidence
Food source to pests?	Not documented to be a food source to pests.	L	M
Provides harbor?	Plant not documented to provide harbour for serious pests.	L	M
Agriculture			
Question	Comments	Rating	Confidence
Impact yield?	Not a weed of agriculture.	L	M
Impact quality?	Not a weed of agriculture.	L	M
Affect land value?	Weed not documented to affect land value.	L	M
Change land use?	Weed not known to cause a change in priority of land use.	L	M
Increase harvest costs?	Not a weed of agriculture.	L	M
Disease host/vector?	Weed not known to be an alternative host or vector for diseases of agriculture.	L	M
Impact Score			0.3575

Present distribution of *Gymnocoronis spilanthoides* in Victoria

Scientific name: *Gymnocoronis spilanthoides* DC.

Common name(s): Senegal tea plant, temple plant

Status:

Habitat:

Humid tropics, subtropics and warm-temperate regions. Confined to wet marshy soils and still or very slowly flowing waters. (Parsons & Cuthbertson 2001)



Potential distribution of *Gymnocoronis spilanthoides* in Victoria

Scientific name: *Gymnocoronis spilanthoides* DC.

Common name(s): Senegal tea plant, temple plant

Status:

Habitat:

Humid tropics, subtropics and warm-temperate regions. Confined to wet marshy soils and still or very slowly flowing waters. (Parsons & Cuthbertson 2001)

Potential distribution produced from CLIMATE modelling refined by applying suitable landuse and vegetation type overlays with CMA boundaries

MAP OVERLAYS USED.

Land Use:

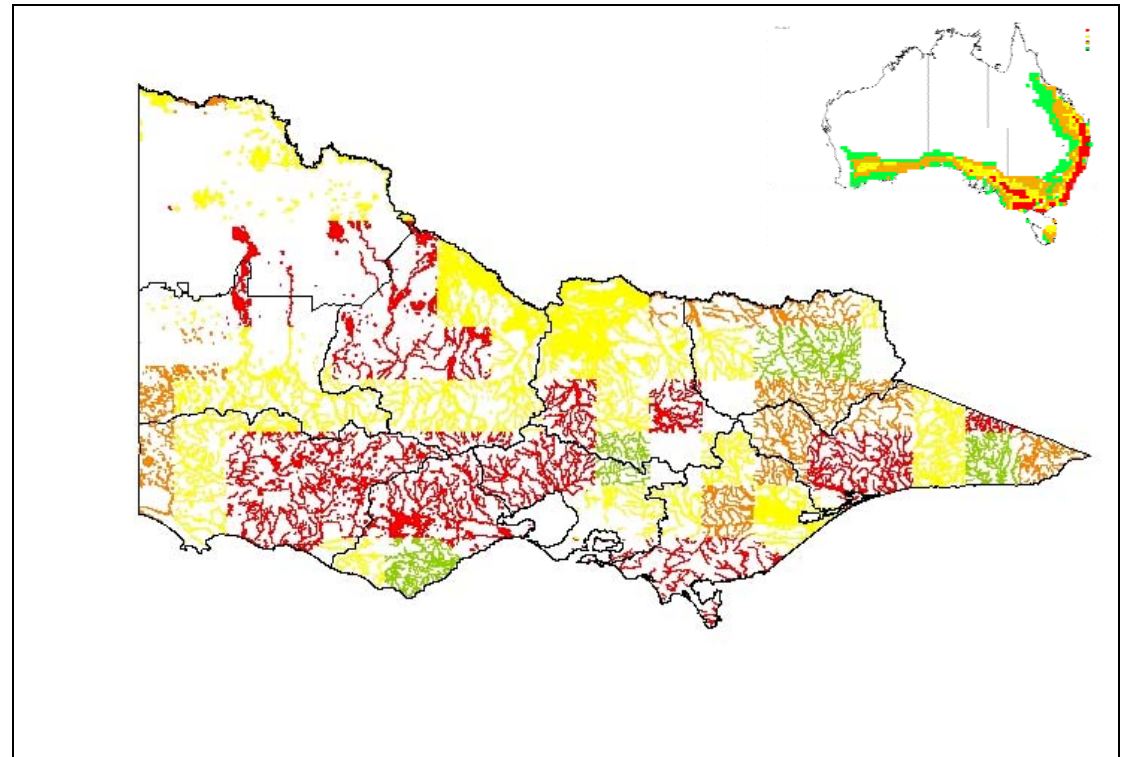
Broad vegetation types

Swamp scrub; riverine grassy woodland; riparian forest.

Colours indicate possibility of *Gymnocoronis spilanthoides* infesting these areas.

 Red	= Very high	 Yellow	= High
 Orange	= Medium	 Green	= Likely

In the non-coloured areas the plant is unlikely to establish as the climate, soil or landuse is not presently suitable.



Department of Primary Industries Weed Assessment Record

Scientific Name: *Heracleum mantegazzianum*

Common Name: giant hogweed

Invasiveness

Establishment			
Question	Comments	Rating	Confidence
Germination requirements?	'Germinates from early spring throughout the growing season, after exposure to winter temperatures' (ISSG 2004). 'Under favourable conditions some germination of seeds take place in the autumn'.. 'period of chilling and moisture are prerequisites for germination' (Tiley et al 1996). Requires natural seasonal disturbances for germination.	MH	H
Establishment requirements?	'In warmer climates, it is favoured by semishaded habitats'. 'Widespread where soil moisture is maintained throughout the year' 'Sufficient depth of soil or crevice size is required to allow the development of the tap-root' (Tiley et al 1996). Can establish under moderate canopy cover.	MH	H
How much disturbance is required?	Most common 'along roadsides, other rights-of-way, vacant lots, streams and rivers" (ISSG 2004). 'Rare in tilled, landscaped or grazed habitats and is best suited to undisturbed or unmanged sites' (Tiley et al 1996). Establishes in minor disturbed natural ecosystems.	MH	H

Growth/Competitive			
Question	Comments	Rating	Confidence
Life form?	Perennial herb (Tiley et al 1996). Perennating buds formed on the crown and tuberous root stalk' (ISSG 2004). Life form - Geophyte.	ML	M
Allelopathic properties?	Not described in most of the literature but Solymosi (1996) lists it as a new allelopathic species. Degree of alellopathy unknown.	M	H
Tolerates herb pressure?	'Eaten by cattle, sheep, pigs and goats' .. 'Pig foraging would eradicate plants through damage to their roots' .. 'Seven years after sheep grazing it was found to be eradicated and no viable seeds remained in the soil seed bank'. The potential for biological control was studied but 'none of the organisms were shown to cause sufficient damage to reduce plant growth seriously or to prevent flowering and fruiting' (Tiley et al 1996). Weed may still persist.	ML	H
Normal growth rate?	'Highly competitive owing to its rapid and prolific growth' (Tiley et al 1996). Moderately rapid growth.	MH	H
Stress tolerance to frost, drought, w/logg, sal. etc?	'Incidence of frost and cold is not limiting and the deep-rooting habit confers resistance to moderate summer drought'. 'Tolerant of permanently moist soil, waterlogging and winter flooding'. 'Occurrence of plants .. within reach of sea spray indicate a tolerance to salt' (Tiley et al 1996).	MH	H

Reproduction			
Question	Comments	Rating	Confidence
Reproductive system	'Reproduction is entirely by seed ... there are no reports of reproduction by vegetative means' (Tiley et al 1996). Sexual reproduction – no evidence if self or cross-pollination or both.	L	H
Number of propagules produced?	'Each flower produces two mericarp fruits thus giving a potential seed production of over 100 000 per plant' (Tiley et al 1996). Above 2000.	H	H

Department of Primary Industries Weed Assessment Record

Scientific Name: *Heracleum mantegazzianum*

Common Name: giant hogweed

Reproduction			
Question	Comments	Rating	Confidence
Propagule longevity?	'Information on viability is fragmentary and conflicting...Lundstrom notes seeds remaining viable for up to 15 years. Morton reports a viability period of up to seven years' 'In moist habitats, seeds rapidly deteriorate and rot' (Tiley et al 1996). 'Seed longevity is known to be greater than seven years' (ISSG 2004).	L	H
Reproductive period?	'Forms a dense canopy' (ISSG 2004). 'Believed to be monocarpic, dying after first flowering and seed set' (ISSG 2004). Mature plant produces viable propagules for only 1 year.	L	H
Time to reproductive maturity?	'Can flower in its second, third, fourth or fifth year, but most flowered in their third year' (Tiley et al 1996). 2 – 5 years to reproductive maturity.	ML	H
Dispersal			
Question	Comments	Rating	Confidence
Number of mechanisms?	May be spread 'by consumption of the fruits or mericarps by birds' (ISSG 2004). 'Wind is a primary means of dispersal' (Tiley et al 1996). Accidental spread by vehicles.	MH	H
How far do they disperse?	'The bulk of seeds fall within short distances of the parent plant' .. 'Long-distance dispersal occurs naturally along water courses and fruits float in water for up to three days' 'Theoretically the seeds could be carried many kilometres .. most seeds and seedlings found within 10m of the colony' (Tiley et al 1996).	ML	H
Invasiveness Score			0.5652

Department of Primary Industries Weed Assessment Record

Scientific Name: *Heracleum mantegazzianum*

Common Name: giant hogweed

Impact

Social			
Question	Comments	Rating	Confidence
Restrict human access?	Can grow from 4.5 to 6m forming a dense canopy. 'Stems and stalks produce sturdy pustulate bristles which contain a toxic sap' (ISSG 2004). Plant often found along rivers and streams. Likely to impede individual access.	ML	MH
Reduce tourism?	'Conspicuous and attractive' (Tiley et al 1996). Can grow up to 6m. Most common 'along roadsides, other rights-of-way, vacant lots, streams and rivers' 'Stems and stalks produce sturdy pustulate bristles which contain a toxic sap' (ISSG 2004). Some recreational uses (eg. Fishing, swimming) may be affected.	MH	MH
Injurious to people?	'Stems and stalks produce sturdy pustulate bristles which contain a toxic sap' 'Direct skin contact with the plant induces extreme photosensitivity, which in turn can lead to severe, slow to heal burns and scarring' (ISSG 2004). Extremely toxic.	H	MH
Damage to cultural sites?	No documented evidence to indicate plant would cause damage to cultural sites.	L	MH
Abiotic			
Question	Comments	Rating	Confidence
Impact flow?	Although plant is a freshwater weed (ISSG 2004), there is no documented evidence that it will impact on water flow.	L	MH
Impact water quality?	Although plant is a freshwater weed (ISSG 2004), there is no documented evidence that it will impact on water quality.	L	MH
Increase soil erosion?	'Tap-root, 45-60cm, initially narrow, becoming thicker and more divided with age' (Tiley et al 1996). 'It forms a dense canopy, out competing native riparian species and results in an increase in soil erosion along the stream banks where it occurs' (ISSG 2004). Moderate probability of large scale soil movement.	ML	MH
Reduce biomass?	'It forms a dense canopy, out competing native riparian species' (ISSG 2004). 'Most frequent as a colonizer of open ruderal communities, disturbed habitats or bare ground .. can also invade communities such as grassland' (Tiley et al 1996). In these instances, biomass likely to increase.	L	H
Change fire regime?	Plant is a freshwater weed and often found along streams and rivers (ISSG 2004). Negligible effect on fire risk.	L	MH
Community Habitat			
Question	Comments	Rating	Confidence
Impact on composition High value EVC	EVC=damp sands herb-rich woodland (BCS = V); CMA=Wimmera; Bioreg=Wimmera; CLIMATE potential=VH. 'It forms a dense canopy, out competing native riparian species' (ISSG 2004). 'Most frequent as a colonizer of open ruderal communities, disturbed habitats or bare ground .. can also invade communities such as grassland' (Tiley et al 1996). Major displacement of some dominant spp. within the lower strata.	MH	H

Department of Primary Industries Weed Assessment Record

Scientific Name: *Heracleum mantegazzianum*

Common Name: giant hogweed

Community Habitat			
Question	Comments	Rating	Confidence
Impact on composition Medium value EVC	EVC=plains sedgy woodland (BCS = V); CMA=Wimmera; Bioreg=Wimmera; CLIMATE potential=VH. 'It forms a dense canopy, out competing native riparian species' (ISSG 2004). 'Most frequent as a colonizer of open ruderal communities, disturbed habitats or bare ground .. can also invade communities such as grassland' (Tiley et al 1996). Major displacement of some dominant spp. within the lower strata.	MH	H
Impact on composition Low value EVC	EVC=shrubby woodland (BCS = V); CMA=Wimmera; Bioreg=Wimmera; CLIMATE potential=VH. 'It forms a dense canopy, out competing native riparian species' (ISSG 2004). 'Most frequent as a colonizer of open ruderal communities, disturbed habitats or bare ground .. can also invade communities such as grassland' (Tiley et al 1996). Major displacement of some dominant spp. within the lower strata.	MH	H
Impact on structure?	'It forms a dense canopy, out competing native riparian species' (ISSG 2004). 'Most frequent as a colonizer of open ruderal communities, disturbed habitats or bare ground .. can also invade communities such as grassland' (Tiley et al 1996). Major effect on lower strata.	MH	H
Effect on threatened flora?	This species is not documented as posing an additional risk to threatened flora.	MH	L
Fauna			
Question	Comments	Rating	Confidence
Effect on threatened fauna?	This species is not documented as posing an additional risk to threatened fauna.	MH	L
Effect on non-threatened fauna?	'It suppresses growth of native plants and with them associated fauna' (ISSG 2004). Plant may have a minor effect on fauna spp.	ML	MH
Benefits fauna?	Plant not documented to provide benefit or facilitate establishment of indigenous fauna.	ML	MH
Injurious to fauna?	'Few cases of injury to animals ... linked mouth ulceration of pygmy goat to browsing...dermatitis injury to a dog was reported .. vesication of the beaks and feet of one-week-old ducklings which had trampled among young plants' (Tiley et al 1996). Plant may be mildly toxic to some fauna spp.	ML	H
Pest Animal			
Question	Comments	Rating	Confidence
Food source to pests?	Plant not documented as providing food source to assist in success of pest animals.	L	MH
Provides harbor?	Plant not documented as providing harbour for pest species.	L	MH
Agriculture			
Question	Comments	Rating	Confidence
Impact yield?	Not a weed of agriculture.	L	H

Department of Primary Industries Weed Assessment Record

Scientific Name: *Heracleum mantegazzianum*

Common Name: giant hogweed

Agriculture			
Question	Comments	Rating	Confidence
Impact quality?	Not a weed of agriculture.	L	H
Affect land value?	Weed not documented to affect value of land.	L	H
Change land use?	Weed not known to cause a change in priority of land use.	L	H
Increase harvest costs?	Not a weed of cropping	L	H
Disease host/vector?	Recorded as host for the carrot fly (<i>Psila rosae</i>) and the parasitic fly <i>Chorebus gracilis</i> . (Tiley et al 1996). Also a host for <i>Sclerotinia sclerotiorum</i> (affecting soybeans) and <i>Melanochaeta acteroae</i> . Provides host to minor pests.	M	H
Impact Score			0.3253

Present distribution of *Heracleum mantegazzianum* in Victoria

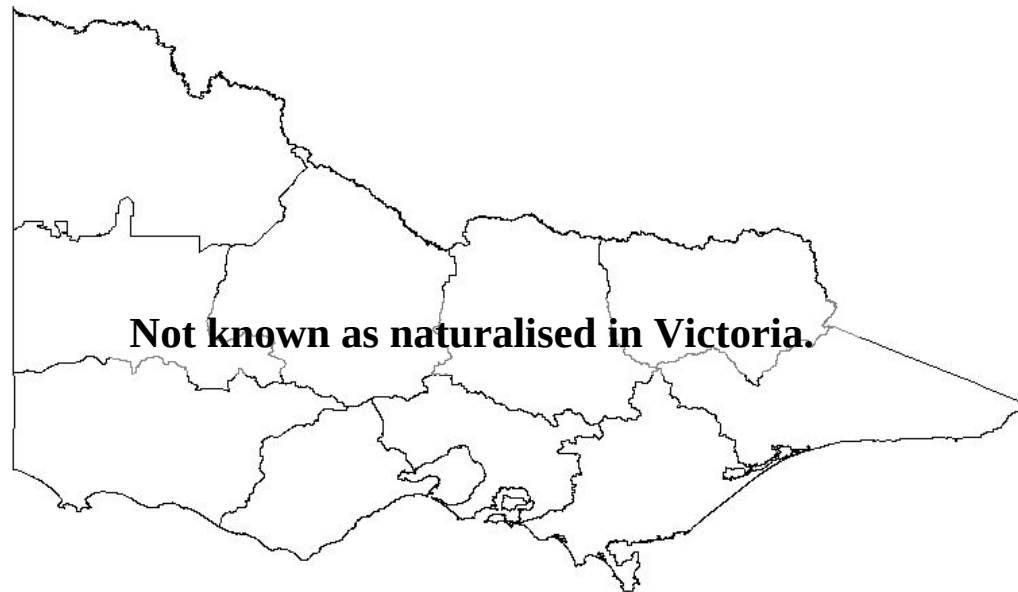
Scientific name: *Heracleum mantegazzianum* Sommier & Levier

Common name(s): giant hogweed

Status:

Habitat:

Native to Asia. Occurs in disturbed areas, riparian zones and water courses. Found in sunny, moist, disturbed habitats (ISSG 2004). Also found in waste ground, along tree lines and open wooded areas (USDA 2005). May colonize a wide variety of habitats but is most common along roadsides, other rights of way, vacant lots, streams and rivers.



Potential distribution of *Heracleum mantegazzianum* in Victoria

Scientific name: *Heracleum mantegazzianum* Sommier & Levier

Common name(s): giant hogweed

Status:

Habitat:

Native to Asia. Occurs in disturbed areas, riparian zones and water courses. Found in sunny, moist, disturbed habitats (ISSG 2004). Also found in waste ground, along tree lines and open wooded areas (USDA 2005). May colonize a wide variety of habitats but is most common along roadsides, other rights of way, vacant lots, streams and rivers.

Potential distribution produced from CLIMATE modelling refined by applying suitable landuse and vegetation type overlays with CMA boundaries

MAP OVERLAYS USED.

Land Use:

Forest private plantation; forest public plantation; horticulture; pasture dryland; pasture irrigation.

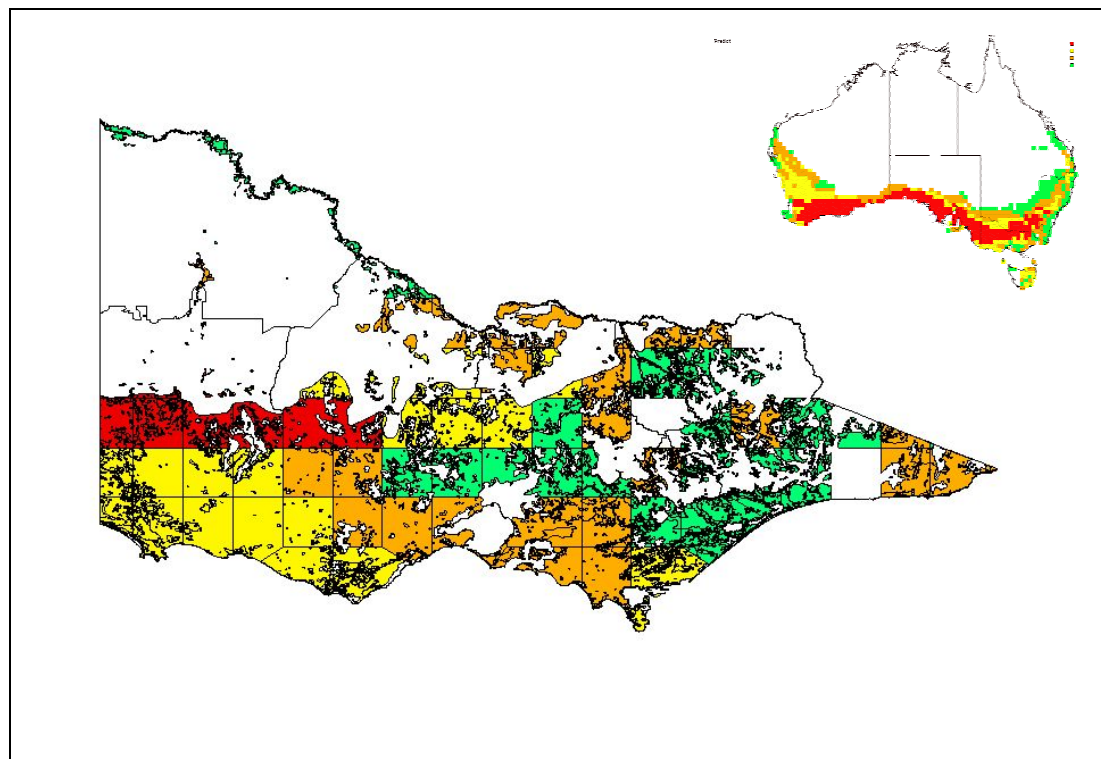
Broad vegetation types

Coastal scrubs and grassland; coastal grassy woodland; heathy woodland; lowland forest; swamp scrub; inland slopes woodland; sedge-rich woodland; moist foothill forest; montane moist forest; sub-alpine woodland; grassland; plains grassy woodland; valley grassy forest; herb-rich woodland; sub-alpine grassy woodland; montane grassy woodland; riverine grassy woodland; riparian forest.

Colours indicate possibility of *Heracleum mantegazzianum* infesting these areas.

 Red	= Very high	 Yellow	= High
 Orange	= Medium	 Green	= Likely

In the non-coloured areas the plant is unlikely to establish as the climate, soil or landuse is not presently suitable.



Present distribution of *Onopordum tauricum* in Victoria

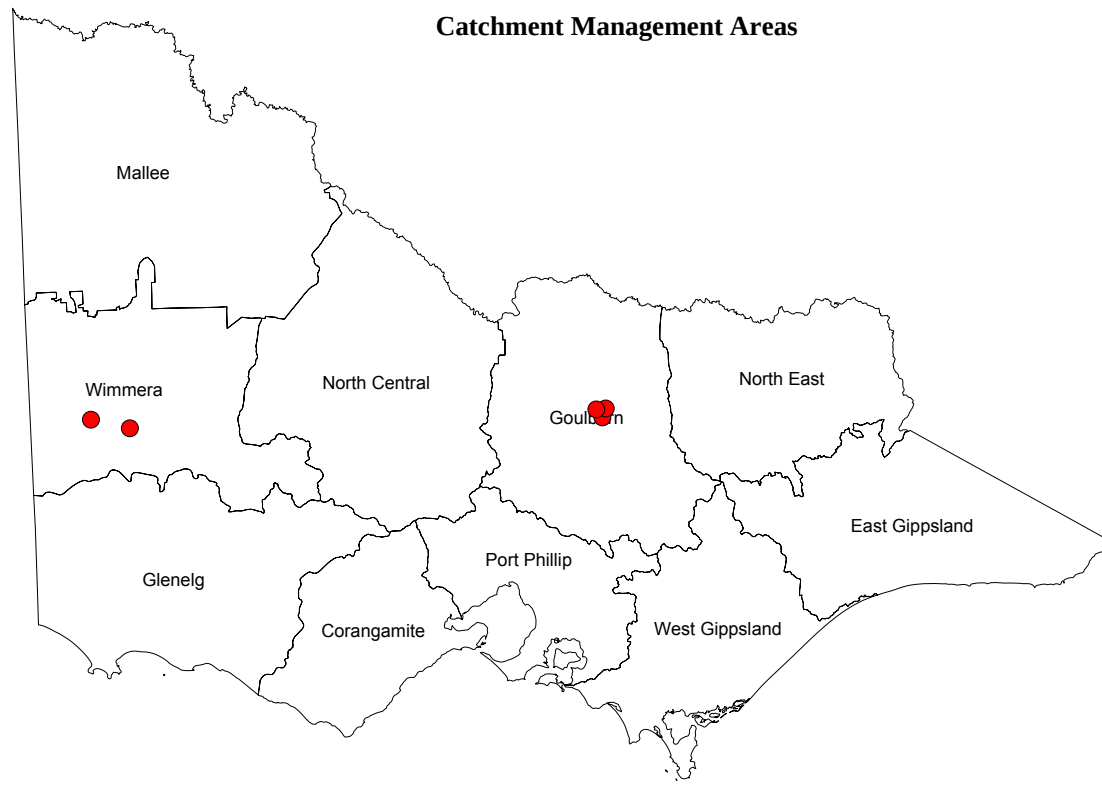
Scientific name: *Onopordum tauricum* Willd.

Common name(s): Scotch thistle, Taurian thistle

Status:

Habitat:

Native to southeastern Europe. Natural areas, disturbed sites, roadsides, fields, and especially sites with fertile soil. In California located in Modoc Plateau, northern North Coast Ranges and Sierra Nevada foothills to 1400 m (Healy *et al* 2005). In Colorado, has been found along roadsides, irrigation ditches, impacted areas along the edge of fields and waste areas. Noticed growing at elevations from 1800 – 2100 m (RBWD 2005).



Potential distribution of *Onopordum tauricum* in Victoria

Scientific name: *Onopordum tauricum* Willd.

Common name(s): Scotch thistle, Taurian thistle

Status:

Habitat:

Native to southeastern Europe. Natural areas, disturbed sites, roadsides, fields, and especially sites with fertile soil. In California located in Modoc Plateau, northern North Coast Ranges and Sierra Nevada foothills to 1400 m (Healy *et al* 2005). In Colorado, has been found along roadsides, irrigation ditches, impacted areas along the edge of fields and waste areas. Noticed growing at elevations from 1800 – 2100 m (RBWD 2005).

Potential distribution produced from CLIMATE modelling refined by applying suitable landuse and vegetation type overlays with CMA boundaries

MAP OVERLAYS USED.

Land Use:

Pasture dryland
Pasture irrigation

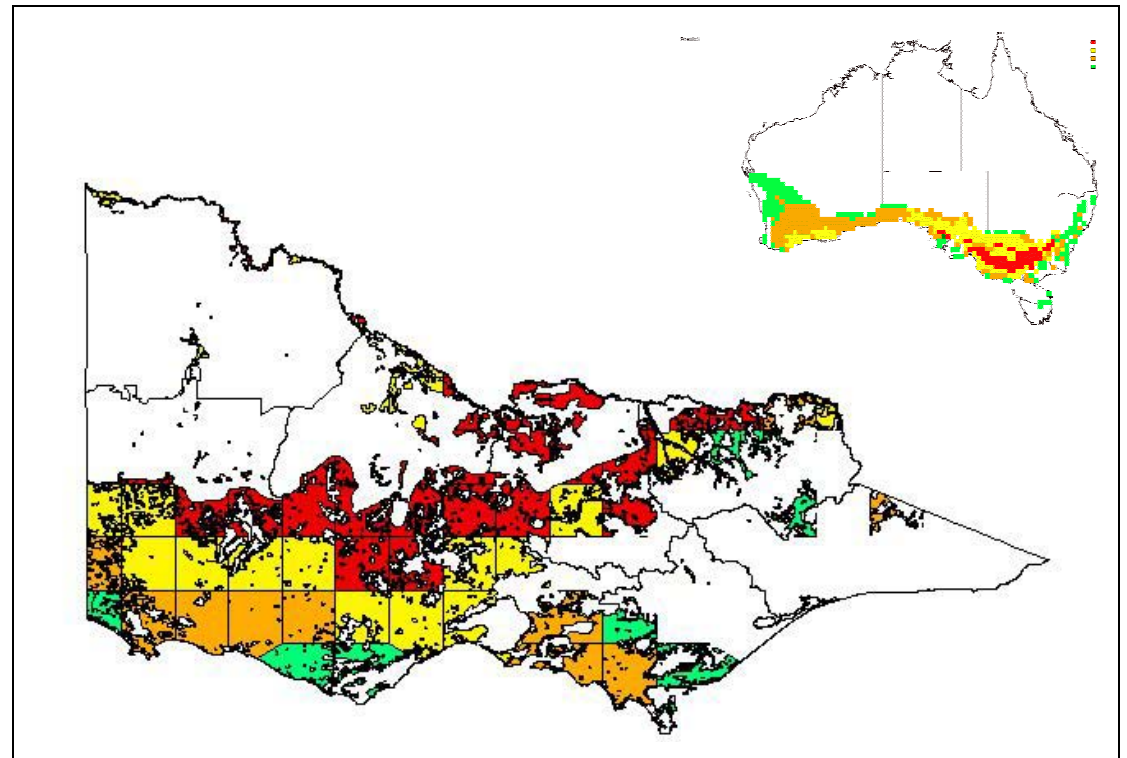
Broad vegetation types

Heathy woodland; Heath; Inland slopes woodland; grassland; Plains grassy woodland; Montane grassy woodland; Riverine grassy woodland; Rainshadow woodland

Colours indicate possibility of *Onopordum tauricum* infesting these areas.

 Red	= Very high	 Yellow	= High
 Orange	= Medium	 Green	= Likely

In the non-coloured areas the plant is unlikely to establish as the climate, soil or landuse is not presently suitable.



Department of Primary Industries Weed Assessment Record

Scientific Name: *Ornithogalum umbellatum*

Common Name: star of Bethlehem

Invasiveness

Establishment			
Question	Comments	Rating	Confidence
Germination requirements?	'Spring perennial' (PFAF 2000). Requires seasonal conditions for germination.	MH	M
Establishment requirements?	'Establishes well in disturbed sites'. 'Heavy shading prevents flowering'(Weber 2003). Can grow in semi-shade or no shade. Requires moist soil (PFAF 2000). Can establish under moderate canopy.	MH	MH
How much disturbance is required?	Where native, grows in hedges, dry places and disturbed ground (Weber 2003). Found on roadsides, open forests, waste places, dumps (FNAEC 1993). Can be found in 'grassy meadows, sunny or semi-shaded banks of streams and drainage ditches'...'usually found in degraded sites, although it can invade high quality natural habitats and displace native species of plants that bloom during spring' (Hilty 2004). Can establish in relatively intact or minor disturbed ecosystems.	MH	MH

Growth/Competitive			
Question	Comments	Rating	Confidence
Life form?	Herb (Weber 2003). Tunicated bulb – lifeform – geophyte.	ML	MH
Allelopathic properties?	'Generally, star-of-Bethlehem showed weak allelopathic effects' (Shiraishi et al 2002). Minor properties.	ML	H
Tolerates herb pressure?	'The plant has few problems with pests' (Hilty 2004). Toxic to livestock (CPPIS 2005). Favoured by heavy grazing pressure as not eaten by animals / insects and not under a biocontrol program in Aust / NZ.	H	MH
Normal growth rate?	Insufficient information to determine rate of growth. Score medium.	M	L
Stress tolerance to frost, drought, w/logg, sal. etc?	'Hardy to about -20°C.. dormant bulbs are very hardy and will withstand soil temperatures down to at least -10°C (PFAF 2000). Regenerates after fire (Calvo et al 2003). Tolerant of summer drought. Requires moist soil but insufficient evidence to determine tolerance to waterlogging. Highly tolerant of at least 2 and susceptible to at least 1.	MH	MH

Reproduction			
Question	Comments	Rating	Confidence
Reproductive system	Spreads by both seed and vegetatively (Weber 2003). Primarily reproduces vegetatively (Hilty 2004).	H	MH
Number of propagules produced?	'Bulbils many' 'Flowers 6-20' (Healy & Edgar 1980). 'bulblets numerous ... produces many offsetting bulbets' (FNAEC 1993). 'Each flower is replaced by a 3-celled seed capsule containing several black seeds' (Hilty 2004). May contain up to 60 seeds per flowering event.	ML	MH
Propagule longevity?	Majority of plants reproduce vegetatively (Hilty 2004).	L	M
Reproductive period?	'Often forms dense colonies that can exclude other species during the spring' (Hilty 2004). Species can form self-sustaining dense monocultures.	H	M

Department of Primary Industries Weed Assessment Record

Scientific Name: *Ornithogalum umbellatum*

Common Name: star of Bethlehem

Reproduction			
Question	Comments	Rating	Confidence
Time to reproductive maturity?	'some species flower within three years' (Morgan 2006). 2-5 years.	ML	MH
Dispersal			
Question	Comments	Rating	Confidence
Number of mechanisms?	'Most of the subsequent dispersal of the plant appears to be due to tillage instruments carrying the bulbs' (Wallwork et al 1992). 'Produces many offsetting bulblets that are transported in soil' (FNAEC 1993). Propagules spread by light vehicular traffic.	MH	H
How far do they disperse?	'Most of the subsequent dispersal of the plant appears to be due to tillage instruments carrying the bulbs' (Wallwork et al 1992). 'Produces many offsetting bulblets that are transported in soil' (FNAEC 1993). No documented evidence of distance propagules likely to disperse. Score Medium.	M	L
Invasiveness Score			0.6038

Department of Primary Industries Weed Assessment Record

Scientific Name: *Ornithogalum umbellatum*

Common Name: star of Bethlehem

Impact

Social			
Question	Comments	Rating	Confidence
Restrict human access?	Grows between 20-40cm (Weber 2003). Found along roadsides, open forests, waste places, dumps (FNAEC 1993). Minimal or negligible impact on human access.	L	MH
Reduce tourism?	'Because of its dark green foliage contrasted with the stark landscape associated with late winter/early spring, it prominently stands out to be noticed' (Fishel 2001).). As weed is 'found along roadsides, open forests, waste places, dumps' (FNAEC 1993) likely that weeds not obvious to the average visitor.	L	M
Injurious to people?	'Skin contact with the bulb can cause dermatitis in sensitive people' (Elias & Dykeman 1982 cited in PFAF 2000). Contains glycosides. 'Symptoms of ingestion include pain in the mouth, nausea, abdominal pain, and diarrhea' (CPPIS 2005). Extremely toxic	H	MH
Damage to cultural sites?	'Because of its dark green foliage contrasted with the stark landscape associated with late winter/early spring, it prominently stands out to be noticed' (Fishel 2001).). As weed is 'found along roadsides, open forests, waste places, dumps' (FNAEC 1993) likely to have a negligible effect on cultural sites.	L	M

Abiotic			
Question	Comments	Rating	Confidence
Impact flow?	Terrestrial species (Weber 2003).	L	MH
Impact water quality?	Terrestrial species (Weber 2003).	L	MH
Increase soil erosion?	'Ornithogalum umbellatum, which will carpet a sunny bank with starry flowers just 10cm off the ground in spring' (Morgan 2006). The ovate-shaped bulbs grow in thick clumps and have a fibrous root system. (Fishel 2001). Ground cover sometimes used to control erosion. Low probability of large-scale soil movement.	L	M
Reduce biomass?	'Forms dense patches that displace native vegetation and reduce species richness' (Weber 2003). 'Foliage withers away by mid-summer' (Hilty 2004). Found in open areas or waste places. In paddocks, will replace pasture species. Direct replacement of biomass by invader.	ML	MH
Change fire regime?	Herb (Weber 2003) – unlikely to change the frequency or intensity of fire risk.	L	L

Community Habitat			
Question	Comments	Rating	Confidence
Impact on composition High value EVC	EVC=damp sands herb-rich woodland (BCS = V); CMA=Wimmera; Bioreg=Wimmera; CLIMATE potential=VH. 'Forms dense patches that displace native vegetation and reduce species richness' (Weber 2003). Major displacement of some dominant species within the lower stratum.	MH	MH

Department of Primary Industries Weed Assessment Record

Scientific Name: *Ornithogalum umbellatum*

Common Name: star of Bethlehem

Community Habitat			
Question	Comments	Rating	Confidence
Impact on composition Medium value EVC	EVC=herb-rich foothill forest (BCS = V); CMA=North Central; Bioreg=goldfields; CLIMATE potential=VH. 'Forms dense patches that displace native vegetation and reduce species richness' (Weber 2003). Major displacement of some dominant species within the lower stratum.	MH	MH
Impact on composition Low value EVC	EVC=montane dry woodland (BCS = V); CMA=Goulburn Broken; Bioreg=Victorian Alps; CLIMATE potential=VH. 'Forms dense patches that displace native vegetation and reduce species richness' (Weber 2003). Major displacement of some dominant species within the lower stratum.	MH	MH
Impact on structure?	'Forms dense patches that displace native vegetation and reduce species richness' (Weber 2003). Major effect on lower stratum.	MH	MH
Effect on threatened flora?	This species is not documented as posing an additional risk to threatened flora.	MH	L
Fauna			
Question	Comments	Rating	Confidence
Effect on threatened fauna?	This species is not documented as posing an additional risk to threatened fauna.	MH	L
Effect on non-threatened fauna?	'Forms dense patches that displace native vegetation and reduce species richness' (Weber 2003). Possible that weed may slightly reduce habitat/food/shelter of non-threatened fauna spp. although no documented evidence to support this.	L	MH
Benefits fauna?	No documented evidence to suggest the weed may provide benefits or facilitate the establishment of indigenous fauna.	H	M
Injurious to fauna?	'Cattle in South Africa have been poisoned, resulting in permanent blindness and death after ingestion' (CPPIS 2005). All parts of the plant are toxic. May also cause problems for indigenous fauna.	H	MH
Pest Animal			
Question	Comments	Rating	Confidence
Food source to pests?	Plant is toxic (CPPIS 2005). No information to suggest that weed would provide a food source to assist in success of pest animals.	L	MH
Provides harbor?	Plant not documented as providing harbour for pest spp.	L	MH
Agriculture			
Question	Comments	Rating	Confidence
Impact yield?	Found in pasture paddocks in South Australia (Wallwork et al 1992). 'Forms dense patches that displace native vegetation and reduce species richness' (Weber 2003). Minor impact on quantity of produce.	ML	MH
Impact quality?	Not documented to have an impact on quality of yield.	L	M

Department of Primary Industries Weed Assessment Record

Scientific Name: *Ornithogalum umbellatum*

Common Name: star of Bethlehem

Agriculture			
Question	Comments	Rating	Confidence
Affect land value?	'A range of herbicides for controlling Star-of-Bethlehem has been tried and proven unsuccessful by farmers...stubble removal is not desirable...burning or tillage of paddocks just prior to sowing is not likely to be an economic or attractive option' (Wallwork et al 1992). Not documented to have an effect on land value.	L	M
Change land use?	Weed not documented to cause a change in priority of land use.	L	M
Increase harvest costs?	'A range of herbicides for controlling Star-of-Bethlehem has been tried and proven unsuccessful by farmers...stubble removal is not desirable...burning or tillage of paddocks just prior to sowing is not likely to be an economic or attractive option' (Wallwork et al 1992). Minor increase in both time and labour.	M	MH
Disease host/vector?	'Serves as a vector for fungal rust transmission' (Weber 2003). 'Leaf rust occurs in susceptible varieties in high rainfall regions in most years. Early infections can result in yield losses up to 20%. ... However, in areas where the weed Star of Bethlehem (<i>Ornithogalum umbellatum</i>) occurs the black teleutospores are able to infect this plant and undergo a sexual reproductive cycle producing a new generation of spores to re-infect barley. The existence of a sexual cycle means the formation of new strains of rust, thus increasing the chance of the rust overcoming current plant resistances. (Holloway & Bedggood 2003). Provides host to minor pests.	M	MH
		Impact Score	0.2918

Present distribution of *Ornithogalum umbellatum* in Victoria

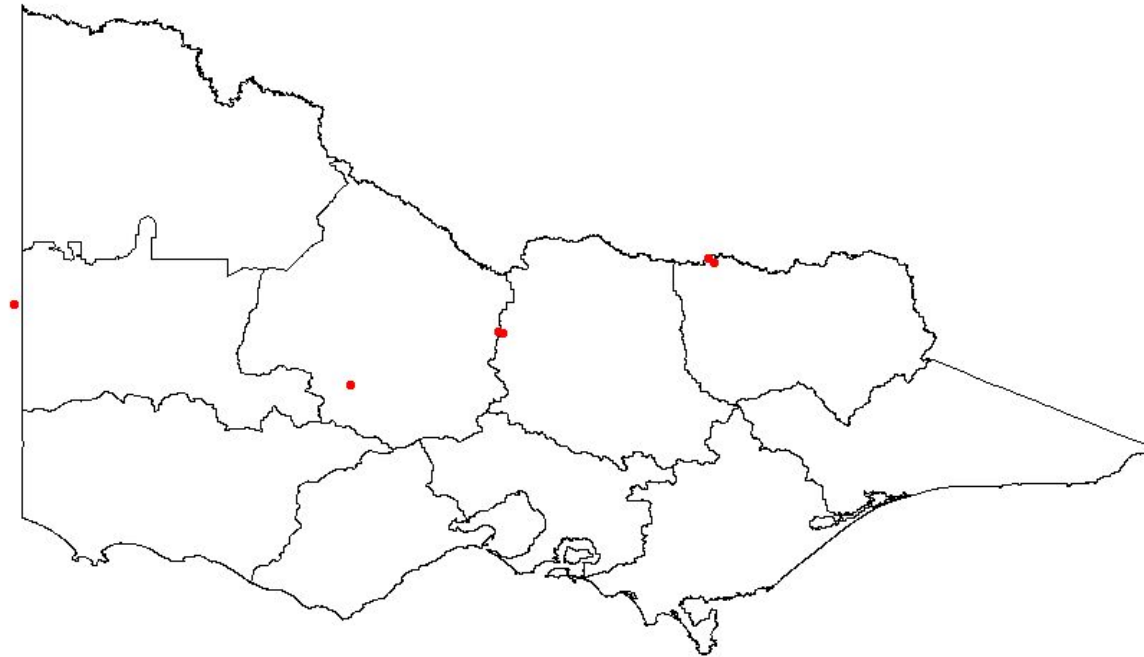
Scientific name: *Ornithogalum umbellatum* L.

Common name(s): Star-of-Bethlehem, nap-at-noon, sleepy-Dick

Status:

Habitat:

Native to Eastern Europe and parts of the Middle East. Where native, grows in hedges, dry places and disturbed ground (Weber 2003). Found on roadsides, open forests, waste places, dumps. From 0 – 1500m (FNAEC 1993). Can also be found in grassy meadows, sunny or semi-shaded banks of streams and drainage ditches (Hilty 2004). Hedges, dry places and disturbed ground.



Potential distribution of *Ornithogalum umbellatum* in Victoria

Scientific name: *Ornithogalum umbellatum* L.

Common name(s): Star-of-Bethlehem, nap-at-noon, sleepy-Dick

Status:

Habitat:

Native to Eastern Europe and parts of the Middle East. Where native, grows in hedges, dry places and disturbed ground (Weber 2003). Found on roadsides, open forests, waste places, dumps. From 0 – 1500m (FNAEC 1993). Can also be found in grassy meadows, sunny or semi-shaded banks of streams and drainage ditches (Hilty 2004). Hedges, dry places and disturbed ground. Roadsides, open forests, waste places, dumps.

Potential distribution produced from CLIMATE modelling refined by applying suitable landuse and vegetation type overlays with CMA boundaries

MAP OVERLAYS USED.

Land Use:

Broadacre cropping; forest private plantation; forest public plantation; horticulture; pasture dryland; pasture irrigated.

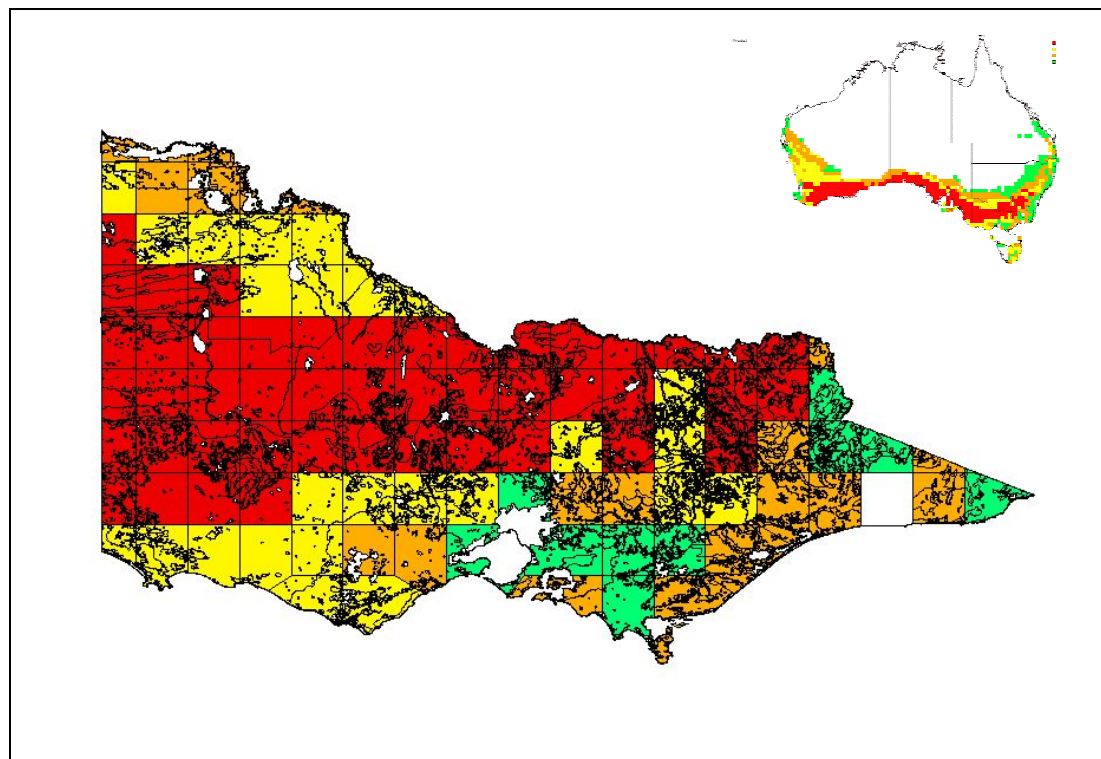
Broad vegetation types

Coastal scrubs and grassland; coastal grassy woodland; heathy woodland; lowland forest; heath; box ironbark forest; inland slopes woodland; sedge-rich woodland; dry foothill forest; moist foothill forest; montane dry woodland; montane moist forest; sub-alpine woodland; grassland; plains grassy woodland; valley grassy forest; herb-rich woodland; sub-alpine grassy woodland; montane grassy woodland; riverine grassy woodland; riparian forest; rainshadow woodland; mallee; mallee heath; Boinka-raak; mallee woodland; mallee/Wimmera woodland.

Colours indicate possibility of infesting these areas.

■ Red	= Very high	■ Yellow	= High
■ Orange	= Medium	■ Green	= Likely

In the non-coloured areas the plant is unlikely to establish as the climate, soil or landuse is not presently suitable.



Department of Primary Industries Weed Assessment Record

Scientific Name: *Peganum harmala*

Common Name: African rue

Invasiveness

Establishment			
Question	Comments	Rating	Confidence
Germination requirements?	'Germination occurs when there are suitably moist conditions and the temperature is at least 18°C' (Michelmore 1990). 'Seeds germinate in early spring, germination continuing sporadically through summer when moisture is adequate' (Parsons & Cuthbertson 2001). Requires natural seasonal conditions for germination.	MH	MH
Establishment requirements?	'Cannot grow in the shade' (PFAF 2000). 'A warm spring to autumn period is required as growth of established plants begins at 20°C (Michelmore 1990). Requires more specific requirements for establishment.	ML	MH
How much disturbance is required?	Found on 'roadsides and other ruderal sites in deserts and steppes. (Zohary 1972). On abandoned, formally cultivated fields (Thalen 1979). Common near human settlements. Establishes in highly disturbed natural ecosystems.	ML	MH

Growth/Competitive			
Question	Comments	Rating	Confidence
Life form?	Perennial herb (Nasir & Ali 1970). 'The plant was classified as a dwarf semishrub-geophyte' (Popov 1992).	ML	MH
Allelopathic properties?	'Aqueous extracts from shoots of [<i>Peganum harmala</i>] ... significantly reduce the germination and radicle growth of <i>Pennisetum americanum</i> , <i>Brassica campestris</i> , lettuce ..' (Hussain et al 1988). Allelopathic properties seriously affecting some plants.	MH	MH
Tolerates herb pressure?	'Poisonous to livestock as in overgrazed areas it is the only surviving vegetation' (Ghafoor 1977). The dried leaves and stems have seen to be eaten by sheep (Thalen 1979). Favoured by heavy grazing as not eaten by animals.	H	H
Normal growth rate?	'Seedling development is slow'. 'Growth of adult plants from the perennial subterranean stems in spring is very rapid' (Michelmore 1990). Moderately rapid growth after established.	MH	MH
Stress tolerance to frost, drought, w/logg, sal. etc?	Found in soil with 'a moderately saline level' (Thalen 1979). 'Can tolerate temperatures down to about -20°C if the soil is dry'. Grows in arid areas. Sensitive to waterlogging (PFAF 2000). Highly tolerant of at least 2. Susceptible to at least one.	MH	MH

Reproduction			
Question	Comments	Rating	Confidence
Reproductive system	Reproduces by seed (Parsons & Cuthbertson 2001). Flowers are hermaphrodite (PFAF 2000). Can reproduce by pieces of rootstock. Vegetative and sexual reproduction.	H	MH
Number of propagules produced?	'Capsule .. 3-celled, many-seeded' (Zohary 1972). 'A single large adult African rue plant at Kaanamore station ... had 1123 capsules with a total of approximately 47 600 seeds produced in that growing season' (Michelmore 1990). Above 2000 propagules produced per flowering event.	H	H

Department of Primary Industries Weed Assessment Record

Scientific Name: *Peganum harmala*

Common Name: African rue

Reproduction			
Question	Comments	Rating	Confidence
Propagule longevity?	'Germination response of seed collected in South Australia was 96%' (Michelmore 1990). 'Up to 85% germination capacity and an ability to maintain a high level of viability into the second year' (Yurchenko & Al'muratova). Insufficient information to determine propagule longevity.	M	L
Reproductive period?	Perennial herb (Parsons & Cuthbertson 2001). Assumed to resprout for at least 3 years.	MH	MH
Time to reproductive maturity?	Perennial (Zohary 1972). 'Seeds germinate in early spring.. flowering begins in late spring to early summer and continues through to March or April. Fruit ripens about one month after anthesis' (Parsons & Cuthbertson 2001). Reaches maturity and produces viable propagules in under a year.	H	MH
Dispersal			
Question	Comments	Rating	Confidence
Number of mechanisms?	'The distribution of this species, considering the rather heavy seeds, may well be by man, eg. with the grain used for seeding' (Thalen 1979). 'Dissemination is principally by seeds, the bulk of which fall close to the parent plant, but some are moved in water flowing over the soil surface and in mud adhering to animals, farm machinery and other vehicles. Some may be spread by stock eating the plant and voiding the seed in their droppings' (Parsons & Cuthbertson 2001).	MH	MH
How far do they disperse?	'Dissemination is principally by seeds, the bulk of which fall close to the parent plant, but some are moved in water flowing over the soil surface and in mud adhering to animals, farm machinery and other vehicles. Some may be spread by stock eating the plant and voiding the seed in their droppings' (Parsons & Cuthbertson 2001). Through machinery and other vehicles, very likely that some propagules will disperse greater than 1km.	H	MH
Invasiveness Score			0.6105

Department of Primary Industries Weed Assessment Record

Scientific Name: *Peganum harmala*

Common Name: African rue

Impact

Social			
Question	Comments	Rating	Confidence
Restrict human access?	Grows up to 75 cm (Ghafoor 1977). Bushy and highly branched. Found most often in ruderal sites. Unlikely to restrict human access.	L	MH
Reduce tourism?	Has an unpleasant smell (Ghafoor 1977). However, found mainly in ruderal sites. Not obvious to the average visitor.	L	MH
Injurious to people?	'The root and seeds have been reported to contain four alkaloids namely harmaline, harmine, peganin and hermalol to the extent of 4%' (Ghafoor 1977). 'In excess, harmine depresses the central nervous system' (PFAF 2000). The plant is toxic although unlikely to be ingested.	L	MH
Damage to cultural sites?	Unlikely to cause damage to cultural sites.	L	MH

Abiotic			
Question	Comments	Rating	Confidence
Impact flow?	Terrestrial species.	L	MH
Impact water quality?	Terrestrial species.	L	MH
Increase soil erosion?	'Tap roots penetrating to 200 mm'..'Ramets may sometimes emerge from lateral roots. Ramets do not produce deep tap roots and the root connection to the parent apparently remains intact' (Michelmore 1990). 'A thick robust rootstock and branching taproot with most laterals below 15cm' (Parsons & Cuthbertson 2001). 'Desirable at stock waters in arid areas as they contribute to lowering soil erosion' (Michelmore 1990). Low probability of large scale soil movement.	L	MH
Reduce biomass?	Found in open areas. In an Iraq study of four stands, P. harmala provided the most crown cover in each situation from 8.6% to 1.0 % (Thalen 1979). Dies off during winter. In some areas during the summer months, likely that biomass will slightly increase.	L	MH
Change fire regime?	Found in open areas. In an Iraq study of four stands, P. harmala provided the most crown cover in each situation from 8.6% to 1.0 % (Thalen 1979). Dies off during winter. Perennial herb. Small or negligible effect on fire risk.	L	MH

Community Habitat			
Question	Comments	Rating	Confidence
Impact on composition High value EVC	EVC=Plains grassland (BCS=E); CMA=Mallee; Bioreg=Murray Mallee; CLIMATE potential=VH. Found in open areas. In an Iraq study of four stands, P. harmala provided the most crown cover in each situation from 8.6% to 1.0 % (Thalen 1979). Sparse / scattered infestations.	L	MH
Impact on composition Medium value EVC	EVC=Chenopod grassland (BCS=D); CMA=Mallee; Bioreg=Lowan Mallee; CLIMATE potential=VH. Found in open areas. In an Iraq study of four stands, P. harmala provided the most crown cover in each situation from 8.6% to 1.0 % (Thalen 1979). Sparse / scattered infestations.	L	MH

Department of Primary Industries Weed Assessment Record

Scientific Name: *Peganum harmala*

Common Name: African rue

Community Habitat			
Question	Comments	Rating	Confidence
Impact on composition Low value EVC	EVC=Montane dry woodland (BCS=LC); CMA=North East; Bioreg=Northern Inland Slopes; CLIMATE potential=VH. Found in open areas. In an Iraq study of four stands, <i>P. harmala</i> provided the most crown cover in each situation from 8.6% to 1.0 % (Thalen 1979). Sparse / scattered infestations.	L	MH
Impact on structure?	Found in open areas. In an Iraq study of four stands, <i>P. harmala</i> provided the most crown cover in each situation from 8.6% to 1.0 % (Thalen 1979). On Minburra station, African rue can be found with an above ground cover of up to eight percent' (Michelmore 1990). Minor effect on less than 20% of the lower stratum.	L	MH
Effect on threatened flora?	This species is not documented as posing an additional risk to threatened flora.	MH	L
Fauna			
Question	Comments	Rating	Confidence
Effect on threatened fauna?	This species is not documented as posing an additional risk to threatened fauna.	MH	L
Effect on non-threatened fauna?	Weed tends to be found in ruderal sites (Parsons & Cuthbertson 2001). Unlikely to have an effect on non-threatened fauna spp.	L	MH
Benefits fauna?	'Has a very low forage value' (Thalen 1979). Provides very little support to desirable species.	H	MH
Injurious to fauna?	'Poisonous to livestock' (Ghafoor 1977). 'Usually death follows only after eating large quantities' (Thalen 1979). 'Avoided by all animals except camels' (Townsend & Guest 1980). Toxic.	H	MH
Pest Animal			
Question	Comments	Rating	Confidence
Food source to pests?	'Has a very low forage value' (Thalen 1979). 'Avoided by all animals except camels' (Townsend & Guest 1980). Unknown as a food source for pest animals.	L	MH
Provides harbor?	Plant not likely to provide harbour for pest species.	L	MH
Agriculture			
Question	Comments	Rating	Confidence
Impact yield?	'African rue has survived but has failed to thrive in cereal crops in South Australia. Losses have not been reported' (Michelmore 1990). Listed as a weed of agriculture (Holm et al 1979). Little or negligible effect on quantity of yield.	L	MH
Impact quality?	Not documented to impact on the quality of yield.	L	MH
Affect land value?	'Reasonable control can be achieved using ... herbicides' (Michelmore 1990). Unlikely that land value will be affected.	L	MH

Department of Primary Industries Weed Assessment Record

Scientific Name: *Peganum harmala*

Common Name: African rue

Agriculture			
Question	Comments	Rating	Confidence
Change land use?	'Reasonable control can be achieved using ... herbicides' (Michelmore 1990). As it can be controlled, unlikely that priority of land value will change.	L	MH
Increase harvest costs?	'Reasonable control can be achieved using ... herbicides' (Michelmore 1990). May be a minor increase in cost of herbicides.	M	MH
Disease host/vector?	Not documented as a host or vector for disease.	L	MH
Impact Score			0.1227

Present distribution of *Peganum harmala* in Victoria

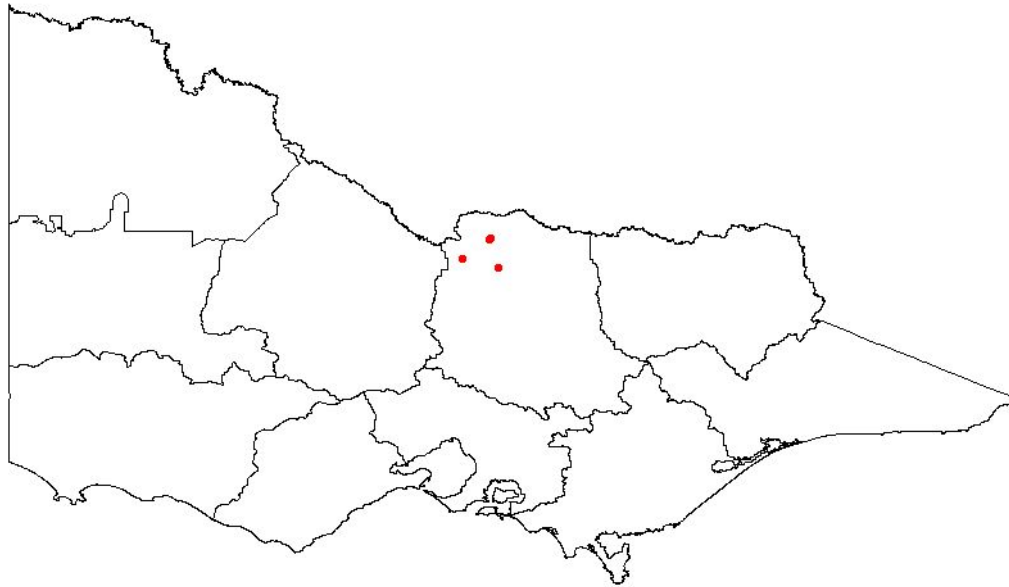
Scientific name: *Peganum harmala* L.

Common name(s): African-rue, Syrian-rue

Status:

Habitat:

Native of North African and Asiatic deserts. Found on 'roadsides and other ruderal sites in deserts and steppes. (Zohary 1972). Occurs in arid and semi-arid regions up to 4000m (Ghafoor 1977). In Iraq, found along desert tracks, around encampments by wells, on rubbish heaps in villages and disturbed soil near ancient ruins and graveyards, also along wadis in the desert, up to 300m or more (Townsend & Guest 1980). In S. Aust, grows densely in an intermittent lake. Seldom establishes on sites that are well vegetated. Capable of growing in a wide range of soils.(Michelmore 1990. It occurs as a weed in dry waste places, roadsides and rundown pastures, especially sites receiving run-off water



Potential distribution of *Peganum harmala* in Victoria

Scientific name: *Peganum harmala* L.

Common name(s): African-rue, Syrian-rue

Status:

Habitat:

Native of North African and Asiatic deserts. Found on 'roadsides and other ruderal sites in deserts and steppes. (Zohary 1972). Occurs in arid and semi-arid regions up to 4000m (Ghafoor 1977). In Iraq, found along desert tracks, around encampments by wells, on rubbish heaps in villages and disturbed soil near ancient ruins and graveyards, also along wadis in the desert, up to 300m or more (Townsend & Guest 1980). In S. Aust, grows densely in an intermittent lake. Seldom establishes on sites that are well vegetated. Capable of growing in a wide range of soils.(Michelmore 1990. It occurs as a weed in dry waste places, roadsides and rundown pastures, especially sites receiving run-off water

Potential distribution produced from CLIMATE modelling refined by applying suitable landuse and vegetation type overlays with CMA boundaries

MAP OVERLAYS USED.

Land Use:

Broadacre cropping; horticulture; pasture dryland; pasture irrigation.

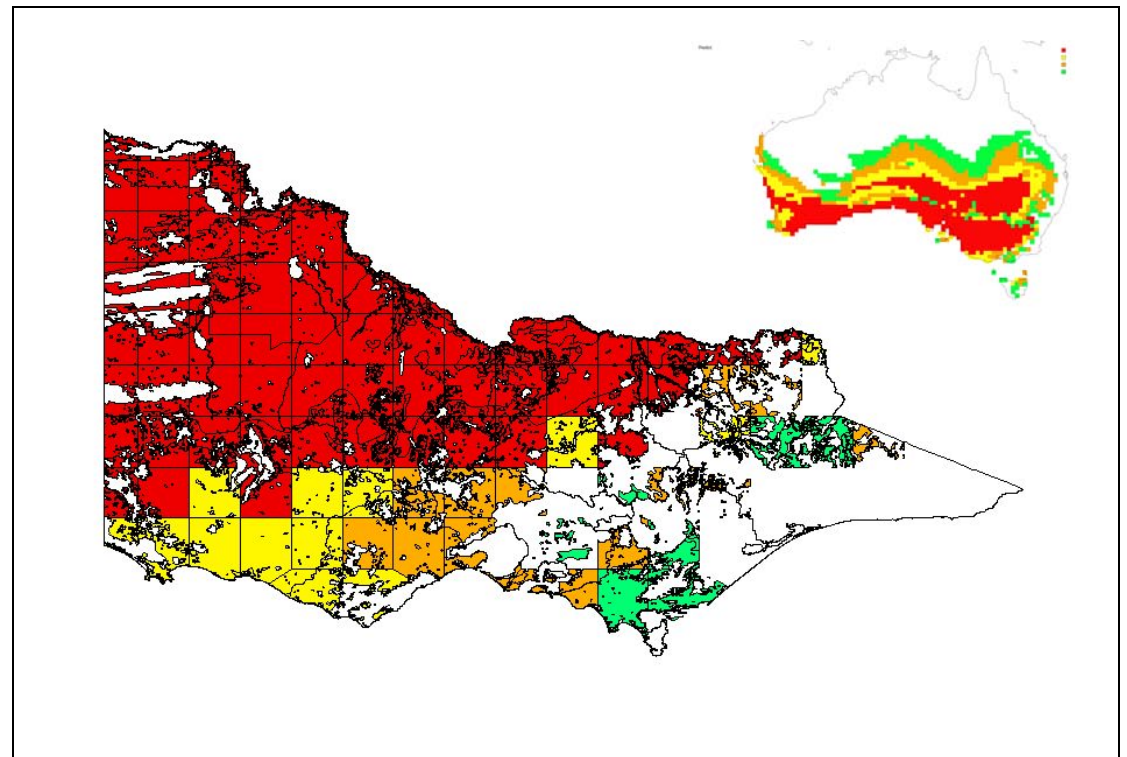
Broad vegetation types

Coastal scrubs and grassland; coastal grassy woodland; box ironbark forest; inland slopes woodland; montane dry woodland; sub-alpine woodland; grassland; plains grassy woodland; sub-alpine grassy woodland; montane grassy woodland; riverine grassy woodland; rainshadow woodland; mallee; Wimmera/mallee woodland.

Colours indicate possibility of *Peganum harmala* infesting these areas.

Red	= Very high	Yellow	= High
Orange	= Medium	Green	= Likely

In the non-coloured areas the plant is unlikely to establish as the climate, soil or landuse is not presently suitable.



Department of Primary Industries Weed Assessment Record

Scientific Name: *Piptochaetium uruguense*

Common Name:

Invasiveness

Establishment			
Question	Comments	Rating	Confidence
Germination requirements?	Insufficient information to determine germination requirements for this species.	M	L
Establishment requirements?	Insufficient information to determine establishment requirements for this species.	M	L
How much disturbance is required?	Insufficient information to determine how much disturbance is required for seedling establishment of this species.	M	L

Growth/Competitive			
Question	Comments	Rating	Confidence
Life form?	Perennial grass (Clayton et al 2005). Life form – grass.	MH	MH
Allelopathic properties?	Insufficient information to determine whether the plant has allelopathic properties.	M	L
Tolerates herb pressure?	Insufficient information to determine the plant's ability to tolerate herbivory pressure.	M	L
Normal growth rate?	Insufficient information to determine the plant's normal growth rate.	M	L
Stress tolerance to frost, drought, w/ogg, sal. etc?	Insufficient information to determine the plant's stress tolerances.	M	L

Reproduction			
Question	Comments	Rating	Confidence
Reproductive system	Insufficient information to determine how the plant reproduces.	M	L
Number of propagules produced?	Insufficient information to determine the number of propagules produced.	M	L
Propagule longevity?	Insufficient information to determine propagule longevity.	M	L
Reproductive period?	Perennial grass (Clayton et al 2005). Likely that the plant will produce viable propagules for greater than two years. Insufficient information to determine length of reproductive period.	M	L
Time to reproductive maturity?	Insufficient information to determine the time to reach reproductive maturity.	M	L

Dispersal			
Question	Comments	Rating	Confidence

Department of Primary Industries Weed Assessment Record

Scientific Name: *Piptochaetium uruguense*

Common Name:

Dispersal			
Question	Comments	Rating	Confidence
Number of mechanisms?	Insufficient information to determine number of dispersal mechanisms for this species.	M	L
How far do they disperse?	Insufficient information to determine how far propagules will disperse.	M	L
Invasiveness Score			0.5006

Department of Primary Industries Weed Assessment Record

Scientific Name: *Piptochaetium uruguense*

Common Name:

Impact

Social			
Question	Comments	Rating	Confidence
Restrict human access?	Perennial grass that grows up to 70cm (Clayton et al 2005). Negligible impact on human access.	L	MH
Reduce tourism?	Unlikely that the weed would be obvious to the average visitor.	L	L
Injurious to people?	Leaf-blade surface is smooth. Has spikelets (Clayton et al 2005) but the plant is unlikely to be injurious to people.	L	MH
Damage to cultural sites?	Unlikely that the plant would cause damage to aesthetics or structure of cultural sites.	L	L
Abiotic			
Question	Comments	Rating	Confidence
Impact flow?	Terrestrial species.	L	MH
Impact water quality?	Terrestrial species.	L	MH
Increase soil erosion?	Perennial grass (Clayton et al 2005). Unlikely that it would contribute to large-scale soil movement.	L	MH
Reduce biomass?	Insufficient information relating to the communities this grass grows in.	M	L
Change fire regime?	Insufficient information to determine the change to fire risk.	M	L
Community Habitat			
Question	Comments	Rating	Confidence
Impact on composition High value EVC	EVC=Streambank shrubland (BCS = V); CMA=Port Phillip; Bioreg=Central Victorian Uplands; CLIMATE potential=VH. However, insufficient information relating to the communities this grass grows in so unsure of the impact the plant would have in this vegetation community.	M	L
Impact on composition Medium value EVC	EVC=Grassy dry forest (BCS = D); CMA=Port Phillip; Bioreg=Central Victorian Uplands; CLIMATE potential=VH. However, insufficient information relating to the communities this grass grows in so unsure of the impact the plant would have in this vegetation community.	M	L
Impact on composition Low value EVC	EVC=Coastal tussock grassland (BCS = V); CMA=Port Phillip; Bioreg=Gippsland plain; CLIMATE potential=VH. However, insufficient information relating to the communities this grass grows in so unsure of the impact the plant would have in this vegetation community.	M	L
Impact on structure?	Insufficient information relating to the communities this grass grows in so unsure of the effect the plant would have on the structure of a vegetation community.	M	L

Department of Primary Industries Weed Assessment Record

Scientific Name: *Piptochaetium uruguense*

Common Name:

Community Habitat			
Question	Comments	Rating	Confidence
Effect on threatened flora?	Insufficient information to determine effect the weed may have on threatened flora.	MH	L
Fauna			
Question	Comments	Rating	Confidence
Effect on threatened fauna?	Insufficient information to determine effect the weed may have on threatened fauna.	MH	L
Effect on non-threatened fauna?	Insufficient information to determine the effect the weed may have on non-threatened fauna species.	M	L
Benefits fauna?	Insufficient information to determine whether this weed benefits or facilitates the establishment of indigenous fauna.	M	L
Injurious to fauna?	Insufficient information to determine whether the weed is injurious to fauna.	M	L
Pest Animal			
Question	Comments	Rating	Confidence
Food source to pests?	Insufficient information to determine whether this weed provides a food source to assist in the success of pest animals.	M	L
Provides harbor?	Insufficient information to determine whether this weed provides harbour to pest animals.	M	L
Agriculture			
Question	Comments	Rating	Confidence
Impact yield?	Insufficient information to determine whether this weed would impact on the quantity of yield .	M	L
Impact quality?	Insufficient information to determine whether this weed would impact on the quality of yield .	M	L
Affect land value?	Insufficient information to determine whether this weed would impact on the value of land.	M	L
Change land use?	Insufficient information to determine whether this weed would cause a change in priority of land use.	M	L
Increase harvest costs?	Insufficient information to determine whether this weed would increase the cost of harvest.	M	L
Disease host/vector?	Insufficient information to determine whether this weed acts as an alternative host or vector for diseases of agriculture.	M	L
Impact Score			0.3693

Present distribution of *Piptochaetium uruguense* in Victoria

Scientific name: *Piptochaetium uruguense* Griseb.

Common name(s):

Status:

Habitat:

Native to South America.



Potential distribution of *Piptochaetium uruguense* in Victoria

Scientific name: *Piptochaetium uruguense* Griseb.

Common name(s):

Status:

Habitat:

Native to South America.

Potential distribution produced from CLIMATE modelling refined by applying suitable landuse and vegetation type overlays with CMA boundaries

MAP OVERLAYS USED.

Land Use:

Horticulture; pasture dryland; pasture irrigation.

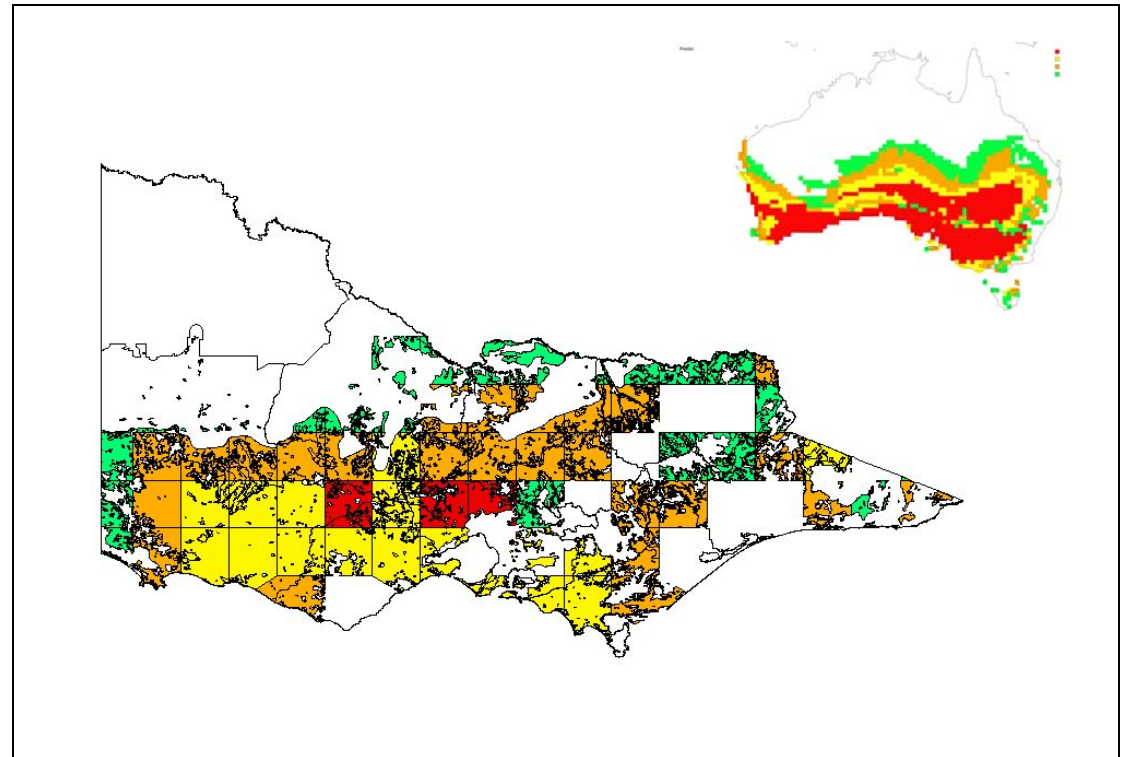
Broad vegetation types

Coastal scrubs and grassland; coastal grassy woodland; box ironbark forest; inland slopes woodland; dry foothill forest; montane dry woodland; grassland; plains grassy woodland; valley grassy forest; herb-rich woodland; sub-alpine grassy woodland; montane grassy woodland; riverine grassy woodland; rainshadow woodland; mallee woodland; Wimmera/mallee woodland.

Colours indicate possibility of *Piptochaetium uruguense* infesting these areas.

Red	= Very high	Yellow	= High
Orange	= Medium	Green	= Likely

In the non-coloured areas the plant is unlikely to establish as the climate, soil or landuse is not presently suitable.



Department of Primary Industries Weed Assessment Record

Scientific Name: *Retama monosperma*

Common Name: bridal veil broom

Invasiveness

Establishment			
Question	Comments	Rating	Confidence
Germination requirements?	Weeds CRC state that <i>Retama monosperma</i> is very closely related to <i>R. raetam</i> . Hence, the two species will be treated similarly and the following information is drawn from the same publication. "Seeds mainly germinate in autumn, but can germinate year round under suitable conditions" (CRC Weed Management, 2003).	H	M
Establishment requirements?	In San Diego, California, it is known at a small site comprising disturbed grassland and coastal sage scrub (Jacobsen 2000). Requires access to open sites and rainfall to germinate and establish.	ML	MH
How much disturbance is required?	Where it occurs as a weed (in California) it is confined to disturbed coastal habitats (Jacobsen 2000). Since Jacobsen's publication another specimen has been recorded in Riverside county. Details of habitat are not given.	ML	MH

Growth/Competitive			
Question	Comments	Rating	Confidence
Life form?	Leguminous sp. of the Fabaceae family (GRIN).	MH	MH
Allelopathic properties?	None described. See also other broom species.	L	L
Tolerates herb pressure?	Ants, birds, (Jacobsen 2000) and rabbits (Dellafore et al 2006) are known to eat the seed. The stems are almost entirely leafless and nothing is documented regarding herbivory. Stems are not consumed.	H	M
Normal growth rate?	"Rapid growth is apparent during peak growth periods in spring and early summer. [Up] to three feet of growth and been noted within one year following cut-stump treatment. Young plants appear to grow one to two feet in the first year," (Jacobsen 2000). Moderate growth that equals or exceeds other shrub species.	MH	MH
Stress tolerance to frost, drought, w/ogg, sal. etc?	Common sp. in maritime pine forests in Portugal (Pereira et al 1995) and as a weed in coastal sage scrub in southern California; Tolerant of saline conditions. Preference for Mediterranean climates; possibly does not tolerate waterlogging. As with closely related <i>R. raetam</i> , <i>R. monosperma</i> may also be drought tolerant and somewhat frost and fire tolerant (Weeds CRC 2003).	M	M

Reproduction			
Question	Comments	Rating	Confidence
Reproductive system	Reproduces by seed (Jacobsen 2000). Related <i>R. raetam</i> is believed to be cross-fertilised only (Whitinger 2006). Assume same for <i>R. monosperma</i> .	L	MH
Number of propagules produced?	"Each plant produces hundreds, and on larger plants thousands, of seeds," (Jacobsen 2000).	H	MH
Propagule longevity?	"Seed remain viable in the soil for several years," (Jacobsen 2000)	L	MH

Department of Primary Industries Weed Assessment Record

Scientific Name: *Retama monosperma*

Common Name: bridal veil broom

Reproduction			
Question	Comments	Rating	Confidence
Reproductive period?	Known to grow to ten feet (3m) tall twenty feet (6 m) across (Jacobsen 2000). Would take several years for this size to be realised. Related R. raetam observed to grow beyond 10 years (Johnson 2005). Assume similar longevity for R. monosperma.	H	MH
Time to reproductive maturity?	No documented evidence of time to reproduce. Assume similar characteristics to R. raetam = 5 years (Johnson 2005).	ML	MH
Dispersal			
Question	Comments	Rating	Confidence
Number of mechanisms?	Single seed contained in dehiscent pod. Most seed likely to fall near the plant. Greatest distribution due to ants and birds (Jacobsen 2000).	H	MH
How far do they disperse?	For bird dispersed seed, likely to be > 200m (Jacobsen 2000).	MH	MH
Invasiveness Score			0.5586

Department of Primary Industries Weed Assessment Record

Scientific Name: *Retama monosperma*

Common Name: bridal veil broom

Impact

Social			
Question	Comments	Rating	Confidence
Restrict human access?	Within its native range, it is a minor component of coastal scrub. As weed in southern California, it is present as a dominant species in disturbed coastal habitats. "Large stands of over 200 plant per acre have been noted," (Jacobsen 2000). No spines or prickles; likely to be a nuisance only.	ML	MH
Reduce tourism?	Can grow to a large size (3 X 6 m) (Jacobsen 2000). Would be noticeable in grassland/coastal scrub situations. Affecting aesthetics only.	ML	L
Injurious to people?	No harmful properties documented. As with other broom spp. the seed is possibly toxic to humans.	M	L
Damage to cultural sites?	Species not documented to cause damage to cultural sites.	L	M
Abiotic			
Question	Comments	Rating	Confidence
Impact flow?	Terrestrial sp. (Jacobsen 2000). Believed to be intolerant of waterlogging. No effect.	L	M
Impact water quality?	Terrestrial sp. (Jacobsen 2000).	L	MH
Increase soil erosion?	"It is unknown whether this plant increases fire risk," (Jacobsen 2000). Pereira et al (1995) show that most dead stems are found in the lowest size class stems (<5mm) and represent only 2% of total biomass. However, broom species broadly are considered flammable.	M	MH
Reduce biomass?	Where it occurs in California on disturbed grassland (particularly annual grasslands) and scrub land (Jacobsen 2000), it is likely to increase biomass.	L	M
Change fire regime?	"It is not known whether this plant increases fire risk," (Jacobsen 2000). Pereira et al (1995) reported the greatest amount of dead biomass was found in <i>R. monosperma</i> was in the smallest branches (<5mm) and represented only 2% of total biomass. Not a significant amount of dead material to ignite or sustain fire. However, bBrooms are broadly considered to be flammable.	M	MH
Community Habitat			
Question	Comments	Rating	Confidence
Impact on composition High value EVC	EVC =Grassy woodland (BCS=E); CMA = North east; Bioregion = Northern Inland Slopes; CLIMATE potential = VH. 'Bridal veil broom crowds out other vegetation and can dominate grasslands and disturbed habitats...Large stands of over 200 plants per acre have been noted' (Jacobsen 2000). Major displacement of dominant species within the lower strata.	MH	MH
Impact on composition Medium value EVC	EVC = Riverine grassy woodland (BCS=D); CMA = North central; Bioregion = Victoria Riverina; CLIMATE potential = H. 'Bridal veil broom crowds out other vegetation and can dominate grasslands and disturbed habitats...Large stands of over 200 plants per acre have been noted' (Jacobsen 2000). Major displacement of dominant species within the lower strata.	MH	MH

Department of Primary Industries Weed Assessment Record

Scientific Name: *Retama monosperma*

Common Name: bridal veil broom

Community Habitat			
Question	Comments	Rating	Confidence
Impact on composition Low value EVC	EVC = Dunefield heathland (BCS=LC); CMA = Mallee; Bioregion = Murray Mallee; CLIMATE potential = H. 'Bridal veil broom crowds out other vegetation and can dominate grasslands and disturbed habitats...Large stands of over 200 plants per acre have been noted' (Jacobsen 2000). Major displacement of dominant species within the lower strata.	MH	MH
Impact on structure?	'Bridal veil broom crowds out other vegetation and can dominate grasslands and disturbed habitats...Large stands of over 200 plants per acre have been noted' (Jacobsen 2000). Major effect on lower strata.	MH	MH
Effect on threatened flora?	Impacts on threatened flora not known.	MH	L
Fauna			
Question	Comments	Rating	Confidence
Effect on threatened fauna?	Impacts on threatened fauna not known.	MH	L
Effect on non-threatened fauna?	The Californian experience is that it, "...crowds out other vegetation and can dominate grasslands and disturbed habitats. It is a threat to the...endangered Stephen's kangaroo rat and California gnatcatcher." (Jacobsen 2000). With increasing weed density, food source for native herbivores is reduced.	MH	MH
Benefits fauna?	Plant is not known to be palatable. El-bana et al (2003) found the closely related species <i>R. raetam</i> is avoided by grazing animals. Birds are known vectors of seed (Jacobsen 2000) and may find limited harbour in large plants.	MH	MH
Injurious to fauna?	Not known to be harmful to animals. Other broom species are toxic (e.g. <i>R. raetam</i> - El Bahri et al 1999). Dellafiore et al 2006 report on the dispersal of <i>Retama monosperma</i> seed by rabbits in Hueva, Spain. Seed was found in pellets, which shows rabbits are able to ingest seed with no demonstrated ill-effects. Harmful effects on native species indeterminate.	M	MH
Pest Animal			
Question	Comments	Rating	Confidence
Food source to pests?	In Spain, rabbits are known to eat and disperse seed (Dellafiore 2006). Food source to serious pest	MH	MH
Provides harbor?	Birds known to eat and disperse seed (Jacobsen 2000). Larger dense bushes may provide limited harbour for bird species.	ML	MH
Agriculture			
Question	Comments	Rating	Confidence
Impact yield?	Not known as a weed of pasture in California (Jacobsen 2000), though it does have the potential to become established in such situations. The literature does not indicate <i>R. monosperma</i> to be as invasive as the related <i>R. raetam</i> , but as the plant is not grazed it may establish over time reducing stocking levels.	ML	MH
Impact quality?	Does not occur in cropping situations or horticulture. Potentially several years to reach reproductive maturity. Little effect	L	L

Department of Primary Industries Weed Assessment Record

Scientific Name: *Retama monosperma*

Common Name: bridal veil broom

Agriculture			
Question	Comments	Rating	Confidence
Affect land value?	Not known as a weed of agriculture. Long establishment time (Johnson 2005).	L	L
Change land use?	Not known as a weed of agriculture.	L	L
Increase harvest costs?	Not known as a weed of cropping or horticulture.	L	L
Disease host/vector?	None implicated for Victoria. Morera (1943) reported the larvae of <i>Taragama repanda</i> Hb. (Lepidoptera: Lasiocampidae), which are injurious to leaves of citrus, breed on <i>R. monosperma</i> in Cadiz, Spain.	L	L
Impact Score			0.3728

Present distribution of *Retama monosperma* in Victoria

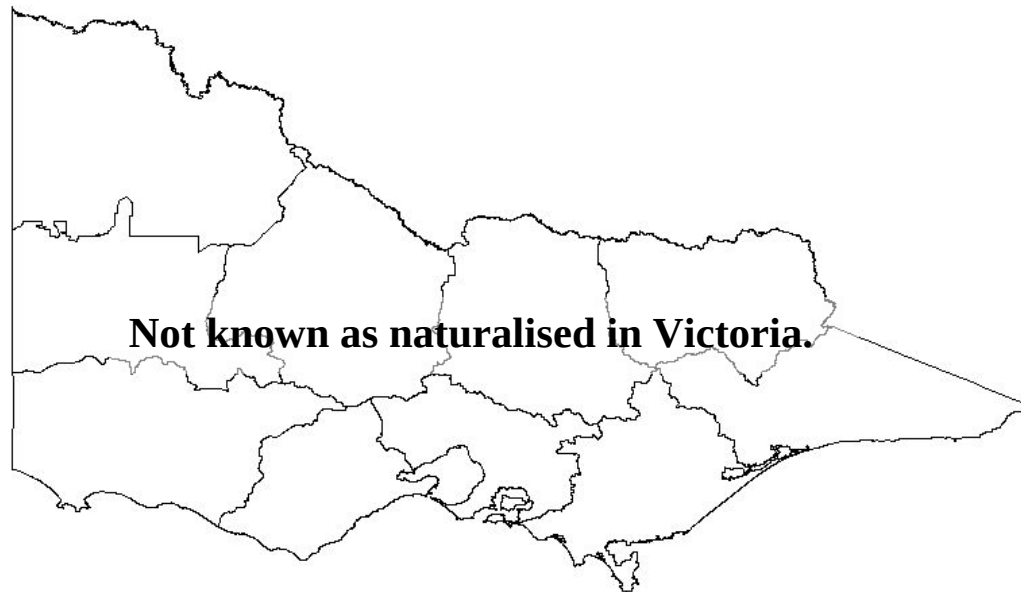
Scientific name: *Retama monosperma* (L.) Boiss.

Common name(s): bridal veil broom

Status:

Habitat:

Native to the Mediterranean where it occurs on sandy soils near the coast and at border marshes. In California, occurs mostly in disturbed annual grassland and disturbed coastal sage scrub.



Potential distribution of *Retama monosperma* in Victoria

Scientific name: *Retama monosperma* (L.) Boiss.

Common name(s): bridal veil broom

Status:

Habitat:

Native to the Mediterranean where it occurs on sandy soils near the coast and at border marshes. In California, occurs mostly in disturbed annual grassland and disturbed coastal sage scrub.

Potential distribution produced from CLIMATE modelling refined by applying suitable landuse and vegetation type overlays with CMA boundaries

MAP OVERLAYS USED.

Land Use:

Pasture dryland

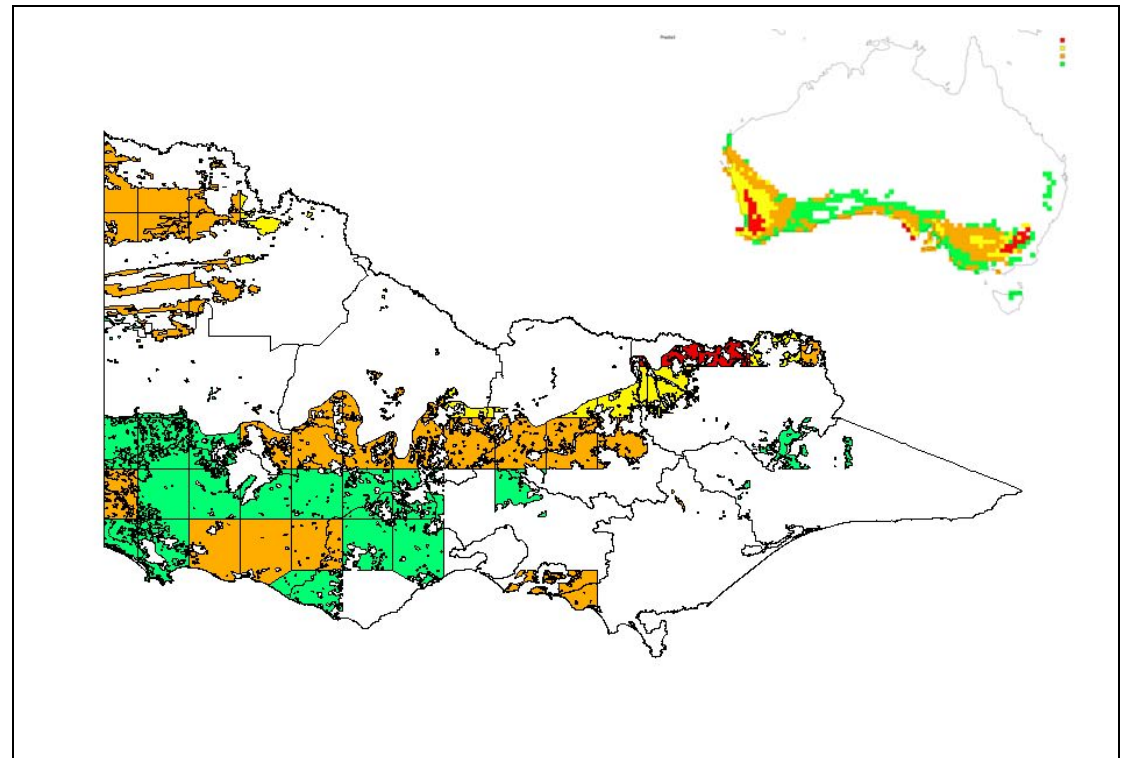
Broad vegetation types

Coastal scrubs and grassland; coastal grassy woodland; heathy woodland; grassland; plains grassy woodland; mallee; mallee woodland; Wimmera/mallee woodland

Colours indicate possibility of *Retama monosperma* infesting these areas.

Red	= Very high	Yellow	= High
Orange	= Medium	Green	= Likely

In the non-coloured areas the plant is unlikely to establish as the climate, soil or landuse is not presently suitable.



Department of Primary Industries Weed Assessment Record

Scientific Name: *Senecio madagascariensis*

Common Name: fireweed

Invasiveness

Establishment			
Question	Comments	Rating	Confidence
Germination requirements?	An 'opportunistic weed'. 'Capable of germinating, growing and reproducing during a large part of the year, although most seed germinates in flushes during autumn and late winter/ spring' .. 'germinates well between 15 and 27 C'.. 'light and nitrates not essential but they generally stimulate germination' (Sindel et al 1998). Opportunistic germinator.	H	H
Establishment requirements?	'Ability to invade and colonize a great variety of habitats'. 'Seedlings demonstrate some tolerance to shade and an ability to recover quickly if shade is removed' (Sindel et al 1998). Can establish under moderate canopy / litter cover.	MH	H
How much disturbance is required?	In Australia 'found predominantly in poorly grassed, neglected or heavily grazed pastures and on cultivated land' 'Soil disturbance often leads to an increase in the emergence of fireweed seedlings' In Natal, 'found on disturbed and fallows, contour banks and road verges in undisturbed natural vegetation and sown pastures'. (Sindel et al 1998). Can establish in minor disturbed natural ecosystem.	MH	H

Growth/Competitive			
Question	Comments	Rating	Confidence
Life form?	'.. bush or herb' (Sindel et al 1998). Life form - other	L	H
Allelopathic properties?	Iwasaki, Y. Yoshikawa, T. & Fujihara, M. to present a paper at International Conference on Ecological Restoration in East Asia in June 2006. Paper titled 'Allelopathic effects of Senecio madagascariensis Poiret on germination and initial growth of revegetation plants'. Unable to obtain paper at present time. Therefore score medium.	M	L
Tolerates herb pressure?	'Not eaten by cattle'. 'Grazing with sheep or goats may be of some use in fireweed control..20 times less susceptible to poisoning than cattle and horses'. 'Damage by pasture slugs or native insects such as the stem borer Patagoniodes farinaria'. 'In excess of 100 species of insects have been found on fireweed in Australia..the larvae of Chalcolampa sp. and N. amica can cause significant defoliation ...may weaken and kill some plants but does not exert any significant control' (Sindel et al 1998). Consumed but recovers quickly.	MH	H
Normal growth rate?	Grows strongly from autumn to spring (Sindel et al 1998). 'Seedlings develop rapidly'. 'S. madagascariensis also had the highest growth rates, equal to or better than other taxa (Radford & Cousens 2000). Rapid growth rate.	H	H
Stress tolerance to frost, drought, w/ogg, sal. etc?	'Young seedlings are more sensitive to frost than older plants'. Suffers 'moisture and temperature stress' (Sindel et al 1998). Fire-tolerant. Tolerant to at least 2 (drought and fire), susceptible to at least 2 (frost and waterlogging).	ML	H

Reproduction			
Question	Comments	Rating	Confidence
Reproductive system	'Disc florets are hermaphrodite'. 'Rooting along the woody stems .. has been observed' (Sindel et al 1998). Reproduces from crown and by seed (PIER 2005). Although reproduces mainly by seed, capable of both.	H	MH
Number of propagules produced?	'Reproduces prolifically. An individual plant may produce up to 230 capitula with 80 seeds per capitulum (total of 18000 seeds) during its life' (Sindel et al 1998). Above 2000.	H	H

Department of Primary Industries Weed Assessment Record

Scientific Name: *Senecio madagascariensis*

Common Name: fireweed

Reproduction			
Question	Comments	Rating	Confidence
Propagule longevity?	90% germination at 20°C recorded three days after collection. 'Under laboratory storage, all seeds are estimated to lose their viability after 4-5 years' Some studies suggest 'some seeds may remain viable in the soil for up to 10 years' (Sindel et al 1998). May survive 5-10 years in soil.	ML	H
Reproductive period?	'Ability to invade and colonize a great variety of habitats in a short period of time' (Sindel et al 1998). Species forms self-sustaining dense monocultures.	H	H
Time to reproductive maturity?	'Short lived perennial plant but behaves most commonly as an annual'. 'The majority of plants die off at the end of their first year of growth, but it is common to find plants which continue to grow and reproduce actively during their second year (Sindel et al 1998). 'Plants may produce flowers 6-10 weeks after emergence'. Reaches maturity and produces viable propagules in under a year.	H	H
Dispersal			
Question	Comments	Rating	Confidence
Number of mechanisms?	In NSW where found on roadsides 'probably been spread by passing traffic' 'The seeds of fireweed are small and light and each is attached to a relatively persistent pappus of white hairs which aids dispersal by wind, especially in convection currents' 'Can also be dispersed in hay and grain products, on clothing and vehicles, and by livestock, birds and other animals' (Sindel et al 1998). Very light wind dispersed seeds.	H	H
How far do they disperse?	'Only a very small fraction of propagules is usually dispersed to a great distance from the parent plant (more than 5 m)' [by wind]. 'Can also be dispersed in hay and grain products, on clothing and vehicles, and by livestock, birds and other animals' (Sindel et al 1998). Very likely that some propagules will disperse greater than 1km.	H	H
Invasiveness Score			0.7893

Department of Primary Industries Weed Assessment Record

Scientific Name: *Senecio madagascariensis*

Common Name: fireweed

Impact

Social			
Question	Comments	Rating	Confidence
Restrict human access?	Grows from 10 to 70cm high (PIER 2005). Tends to be found in agricultural or pastoral areas or on roadsides. Minimal impact on human access.	L	MH
Reduce tourism?	Tends to be found in pastoral and agricultural areas (Sindel et al 1998). Although flowers are highly visible weeds not obvious to the average visitor.	L	MH
Injurious to people?	Not documented to be injurious to people.	L	MH
Damage to cultural sites?	Weed not known to cause damage to cultural sites.		M

Abiotic			
Question	Comments	Rating	Confidence
Impact flow?	Terrestrial species.	L	H
Impact water quality?	Terrestrial species.	L	H
Increase soil erosion?	'Shallow, branched, annual or perennating taproot with numerous fibrous roots, growing from 10 to 20 cm deep' (Sindel et al 1998). Low probability of large scale soil movement as a direct result of weed.	L	H
Reduce biomass?	Many of the plants die off from September to November (Sindel et al 1998). In pasture areas, may be direct replacement of biomass by invader.	ML	H
Change fire regime?	Herbaceous plant. Dies off from September to November (Sindel et al 1998). Generally found with other pasture species so likely that weed would have small or negligible effect on fire risk.	L	H

Community Habitat			
Question	Comments	Rating	Confidence
Impact on composition High value EVC	EVC=grassy woodland (BCS= E); CMA=North Central; Bioreg=Northern inland slopes; CLIMATE potential=VH. 16% of paddocks sampled in NSW scored 7 on a scale of 0 to 7 with 7 being the greatest density (plants <0.5m apart). (Radford et al 1995). Major displacement of some dominant spp. within the lower strata.	MH	H
Impact on composition Medium value EVC	EVC=grassy woodland (BCS= E); CMA=East Gippsland; Bioreg=East Gippsland uplands; CLIMATE potential=VH. 16% of paddocks sampled in NSW scored 7 on a scale of 0 to 7 with 7 being the greatest density (plants <0.5m apart). (Radford et al 1995). Major displacement of some dominant spp. within the lower strata.	MH	H

Department of Primary Industries Weed Assessment Record

Scientific Name: *Senecio madagascariensis*

Common Name: fireweed

Community Habitat			
Question	Comments	Rating	Confidence
Impact on composition Low value EVC	EVC=coast banksia woodland (BCS= E); CMA=East Gippsland; Bioreg=East Gippsland lowlands; CLIMATE potential=VH. 16% of paddocks sampled in NSW scored 7 on a scale of 0 to 7 with 7 being the greatest density (plants <0.5m apart). (Radford et al 1995). Major displacement of some dominant spp. within the lower strata.	MH	H
Impact on structure?	Depends where it occurs and if in pastures depends what pasture species it occurs with. 'Higher fireweed densities to occur within pastures of kikuyu, white clover, couch and paspalum. The opposite trend was observed for fireweed found in ryegrass, native species, phalaris, speargrass, barley grass and bracken dominated pasture' 16% of paddocks sampled in NSW scored 7 on a scale of 0 to 7 with 7 being the greatest density (plants <0.5m apart). (Radford et al 1995). Major effect on lower strata.	MH	H
Effect on threatened flora?	This species is not documented as posing an additional risk to threatened flora.	MH	L
Fauna			
Question	Comments	Rating	Confidence
Effect on threatened fauna?	This species is not documented as posing an additional risk to threatened fauna.	MH	L
Effect on non-threatened fauna?	Not documented to have an effect on non-threatened fauna species.	L	H
Benefits fauna?	Provides very little support to desirable species.	H	H
Injurious to fauna?	'Toxic to livestock'. 'Fireweed fed to three calves in a controlled experiment, caused the death of two within 77 days and depressed growth rate in the third' 'When ingested by livestock, accumulates and damages the liver so as to reduce growth' 'Grazing with sheep or goats may be of some use in fireweed control..20 times less susceptible to poisoning than cattle and horses' (Sindel et al 1998). Plant is toxic. Not documented as to the effect it may have on indigenous fauna if consumed.	H	H
Pest Animal			
Question	Comments	Rating	Confidence
Food source to pests?	Not known as a food source to pest species.	L	H
Provides harbor?	Not documented to provide harbour to pest species.	L	H
Agriculture			
Question	Comments	Rating	Confidence

Department of Primary Industries Weed Assessment Record

Scientific Name: *Senecio madagascariensis*

Common Name: fireweed

Agriculture		Rating	Confidence
Question	Comments		
Impact yield?	In Argentina is 'a significant weed of agricultural crops'. In Australia has 'a significant impact on agriculture due to its invasiveness and competitiveness with useful pasture species, and its toxicity to livestock' 'In a crop of grazing oats, fireweed at a density of 40 plants m2 may reduce pasture yield by over 70% and reduce the grazing area by as much as 60%' 'Experiments designed to quantify pasture production loss due to fireweed have proved inconclusive' (Sindel et al 1998). '43% of dairy and pastoral farmers considered (it) their worst weed' 'Estimated to cost the dairy industry alone in the order of \$A10 million per annum in lost animal production and control expenses' (Radford et al 1995). Serious impact on quantity.	H	H
Impact quality?	'In a crop of grazing oats, fireweed at a density of 40 plants m2 may reduce pasture yield by over 70% and reduce the grazing area by as much as 60%' (Sindel et al 1998). Mainly reduces yield but also has the potential to impacts upon the quality of the pasture species.	MH	H
Affect land value?	'Farmers are also conscious that the weed looks bad on their properties and regard it as the worst weed of pastures in most coastal areas of NSW' (Sindel et al 1998). 'Highly visible when flowering, leading to the perception that it competes with pasture and discourages stock from grazing amongst it' (Radford et al 1995). Not specifically documented, but likely that the weed will decrease land value by <10%	MH	L
Change land use?	'Herbicides ... although not applied very extensively, can be very effective' "Handweeding has not met with overwhelming success". "The success achieved with mowing .. has been somewhat variable"(Sindel et al 1998). If weeds cannot be controlled then possible that priority land use may be downgraded.	MH	L
Increase harvest costs?	'Herbicides ... although not applied very extensively, can be very effective' "Handweeding has not met with overwhelming success". "The success achieved with mowing .. has been somewhat variable"(Sindel et al 1998). Major increase in time and labour.	H	H
Disease host/vector?	Not documented as a host or vector for disease of agriculture.	L	H
		Impact Score	0.4181

Present distribution of *Senecio madagascariensis* in Victoria

Scientific name: *Senecio madagascariensis* Poir.

Common name(s): fireweed

Status:

Habitat:

In NSW found on roadsides, around water holes and irrigated areas. In Qld found in coastal pastures. In Southern Africa, occurs up to 1500m above sea level. In Natal, found on disturbed and fallows, contour banks and road verges in undisturbed natural vegetation and sown pastures. In Argentina, is a significant weed of agricultural crops and grasslands. Currently restricted in distribution to humid maritime and sub-tropical regions of the world. Annual precipitation ranged from 500 to 1000mm and occasionally reaches 1500mm. In Australia annual mean temperature ranges from 12.3 to 20.1 C. Able to grow on a wide range of soils but prefers well drained. (Sindel *et al* 1998). Subhumid to humid subtropical woodland (PIER 2005).



Potential distribution of *Senecio madagascariensis* in Victoria

Scientific name: *Senecio madagascariensis* Poir.

Common name(s): fireweed

Status:

Habitat:

In NSW found on roadsides, around water holes and irrigated areas. In Qld found in coastal pastures. In Southern Africa, occurs up to 1500m above sea level. In Natal, found on disturbed and fallows, contour banks and road verges in undisturbed natural vegetation and sown pastures. In Argentina, is a significant weed of agricultural crops and grasslands. Currently restricted in distribution to humid maritime and sub-tropical regions of the world. Annual precipitation ranged from 500 to 1000mm and occasionally reaches 1500mm. In Australia annual mean temperature ranges from 12.3 to 20.1 C. Able to grow on a wide range of soils but prefers well drained. (Sindel *et al* 1998). Subhumid to humid subtropical woodland (PIER 2005).

Potential distribution produced from CLIMATE modelling refined by applying suitable landuse and vegetation type overlays with CMA boundaries

MAP OVERLAYS USED.

Land Use:

Broadacre cropping; Pasture dryland; Pasture irrigation

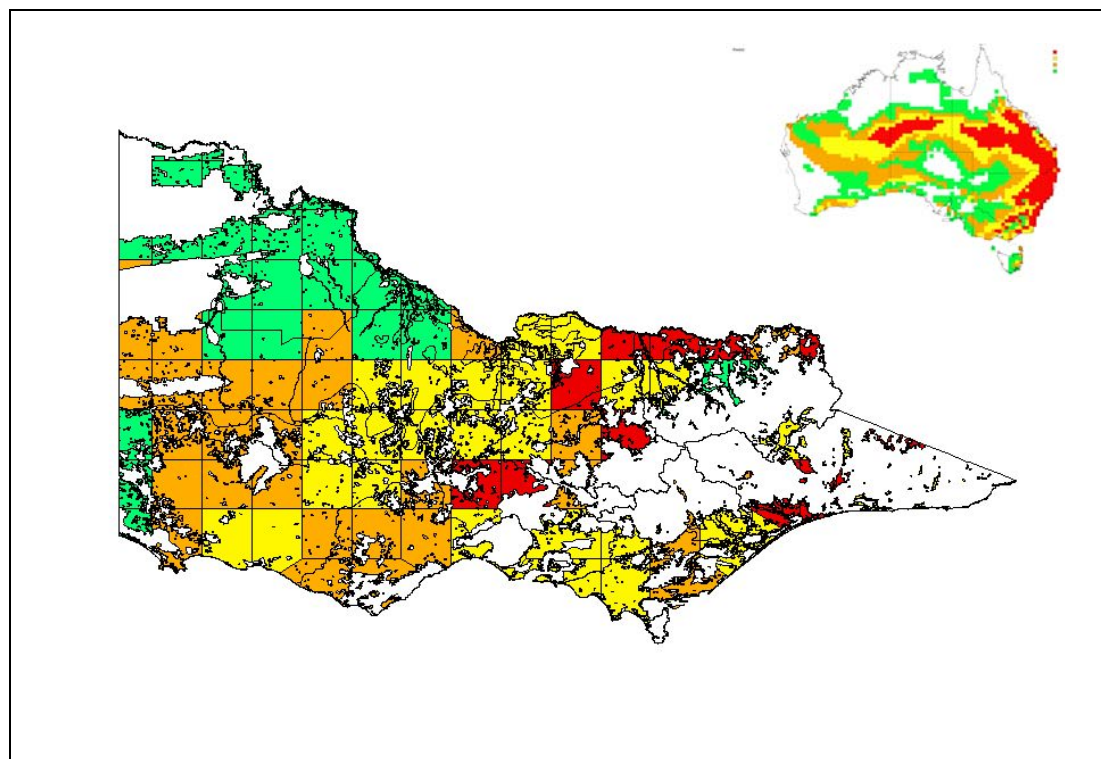
Broad vegetation types

Coastal scrubs and grassland; coastal grassy woodland; grassland; plains grassy woodland; riverine grassy woodland.

Colours indicate possibility of infesting these areas.

Red	= Very high	Yellow	= High
Orange	= Medium	Green	= Likely

In the non-coloured areas the plant is unlikely to establish as the climate, soil or landuse is not presently suitable.



Department of Primary Industries Weed Assessment Record

Scientific Name: *Striga asiatica* (L.) Kuntze

Common Name: witchweed

Invasiveness

Establishment			
Question	Comments	Rating	Confidence
Germination requirements?	Obligate parasitic pest plant (Mohamed et al, 1998). Require specific plant exudates to germinate, however, not all of these plant sources can act as hosts for the parasite (Eplee, 1992). Requires specific factors that are not part of an annual cycle of the system to germinate.	L	H
Establishment requirements?	Found in open, sunny habitats (Musselman, 1980).	ML	H
How much disturbance is required?	Prefer permanently disturbed habitats (Musselman, 1980). "Known to occur widely in savanna grasslands, but at much lower densities than observed in agricultural systems" (Cochrane & Press, 1997). Establishes at high densities in areas of major disturbance.	L	H

Growth/Competitive			
Question	Comments	Rating	Confidence
Life form?	Annual herb (Holm, 1977) and obligate parasite (Cochrane & Press, 1997).	L	MH
Allelopathic properties?	The growth of the host plant is depressed by competition for carbon and nutrients, but this species causes pathological symptoms that seem to be linked to compounds produced by the parasite and translocated to the host roots (Rank et al, 2004).	MH	H
Tolerates herb pressure?	Bashir (1987) reports that several insects in India can cause enough damage to <i>Striga asiatica</i> to prevent the production of viable seed, however, since this species does not occur on mainland Australia (AVH, 2006), no information was found concerning the situation in Australia.	M	L
Normal growth rate?	The host type is [likely to be] a major factor in determining vigour and growth" with some plants reaching heights of 41-50cm with many branches (Cochrane & Press, 1997).	MH	H
Stress tolerance to frost, drought, w/logg, sal. etc?	"Occurs on soils which are sometimes temporarily waterlogged" (Cochrane & Press, 1997). <i>Striga</i> survive more often in dry soils, perhaps related to their ability to stimulate root production in their hosts (Vidhyasekara, 2004). Tolerance of frost, salinity unknown.	M	H

Reproduction			
Question	Comments	Rating	Confidence
Reproductive system	Flowers self-pollinate before opening (Gethi et al, 2005).	L	H
Number of propagules produced?	"Each plant produces large numbers (between 25 000 and 200 000)...of seed" in general for the genus (Cochrane & Press, 1997).	H	H
Propagule longevity?	"Under suitable conditions, witchweed seeds are able to survive for more than a decade in the soil" (Eplee, 1992); 10-20 years (Cochrane & Press, 1997).	MH	H

Department of Primary Industries Weed Assessment Record

Scientific Name: *Striga asiatica* (L.) Kuntze

Common Name: witchweed

Reproduction			
Question	Comments	Rating	Confidence
Reproductive period?	Annual herb (Holm, 1977) produces viable propagules for less than one year.	L	MH
Time to reproductive maturity?	Life cycle completed in 10 to 16 weeks (Stewart, 1987).	H	MH
Dispersal			
Question	Comments	Rating	Confidence
Number of mechanisms?	"Seeds may be distributed as dust in the wind, on fur, feathers," Holm, 1977.	H	MH
How far do they disperse?	Very few propagules might disperse to 1km or more, attached to birds (Holm, 1977). Most is likely to be transported 20-200m by wind (Holm et al, 1997).	ML	MH
Invasiveness Score			0.4105

Department of Primary Industries Weed Assessment Record

Scientific Name: *Striga asiatica* (L.) Kuntze

Common Name: witchweed

Impact

Social			
Question	Comments	Rating	Confidence
Restrict human access?	Usually grow to a height of around 30cm. "Known to occur widely in savanna grasslands, but at much lower densities than observed in agricultural systems" (Cochrane & Press, 1997). Would not impede human access.	L	H
Reduce tourism?	Usually grow to a height of around 30cm and regarded as agricultural weeds. "Known to occur widely in savanna grasslands, but at much lower densities than observed in agricultural systems" (Cochrane & Press, 1997). Not obvious to the 'average' visitor.	L	H
Injurious to people?	The detailed literature on this plant does not note it as injurious to people. Described as "rough with small prickles" (Holm, 1977).	L	MH
Damage to cultural sites?	Usually grow to a height of around 30cm. "Known to occur widely in savanna grasslands, but at much lower densities than observed in agricultural systems" (Cochrane & Press, 1997). Would not impede human access. Little or negligible effect on aesthetics of cultural sites.	L	H

Abiotic			
Question	Comments	Rating	Confidence
Impact flow?	"Cannot survive in wet...areas" (Holm, 1977), only found on soils that are sometimes temporarily waterlogged (Cochrane & Press, 1997). Does not impact on aquatic systems.	L	MH
Impact water quality?	"Cannot survive in wet...areas), only found on soils that are sometimes temporarily waterlogged (Cochrane & Press, 1997)" (Holm, 1977). Does not impact on aquatic systems.	L	MH
Increase soil erosion?	"In a really severe attack the host may be killed so quickly that the witchweed cannot emerge and it too will perish without producing seeds" and can cause complete crop losses (Holm, 1977). This has the potential to leave large tracts of unstable soil bereft of vegetation and prone to erosion.	ML	MH
Reduce biomass?	Whilst this parasite competes with its host for resources such as carbon, this does not account for the scale of decimation observed in infested crops (Rank et al, 2004). "In a really severe attack the host may be killed so quickly that the witchweed cannot emerge and it too will perish without producing seeds" and can cause complete crop losses (Holm, 1977). Biomass is significantly decreased.	H	MH
Change fire regime?	"Known to occur widely in savanna grasslands, but at much lower densities than observed in agricultural systems" (Cochrane & Press, 1997). Unlikely to have a significant impact on fire frequency or intensity.	L	MH

Community Habitat			
Question	Comments	Rating	Confidence
Impact on composition High value EVC	Climate analysis shows no potential distribution in Victoria for this species.	L	H

Department of Primary Industries Weed Assessment Record

Scientific Name: *Striga asiatica* (L.) Kuntze

Common Name: witchweed

Community Habitat			
Question	Comments	Rating	Confidence
Impact on composition Medium value EVC	Climate analysis shows no potential distribution in Victoria for this species.	L	H
Impact on composition Low value EVC	Climate analysis shows no potential distribution in Victoria for this species.	L	H
Impact on structure?	"Known to occur widely in savanna grasslands, but at much lower densities than observed in agricultural systems." Usually grow to a height of around 30cm. True hosts are likely to be grasses only (Cochrane & Press, 1997); "Restricted almost entirely to grasses," (Musselman, 1980). Likely to have a minor effect on the ground layer, only affecting grass species.	L	M
Effect on threatened flora?	Climate analysis shows no potential distribution in Victoria for this species.	L	H
Fauna			
Question	Comments	Rating	Confidence
Effect on threatened fauna?	Climate analysis shows no potential distribution in Victoria for this species.	L	H
Effect on non-threatened fauna?	Unknown.	M	L
Benefits fauna?	Unknown.	M	L
Injurious to fauna?	The detailed literature on this plant does not note it as injurious to animals. Described as "rough with small prickles" (Holm, 1977).	L	MH
Pest Animal			
Question	Comments	Rating	Confidence
Food source to pests?	Unknown.	M	L
Provides harbor?	"Known to occur widely in savanna grasslands, but at much lower densities than observed in agricultural systems." Usually grow to a height of around 30cm and parasitic on grasses. (Cochrane & Press, 1997). Slender stems with thin leaves (Holm, 1977). Unlikely to be dense enough to provide harbour.	L	MH
Agriculture			
Question	Comments	Rating	Confidence

Department of Primary Industries Weed Assessment Record

Scientific Name: *Striga asiatica* (L.) Kuntze

Common Name: witchweed

Agriculture		Rating	Confidence
Question	Comments		
Impact yield?	"Deemed to be a serious threat to United States agriculture, particularly to the vast corn, sorghum and usgar-cane production areas" (Eplee, 1992); "the worst pest encountered by many farmers growing sorghum, millet maize and cowpea in India, Africa and...USA" (Mohamed et al, 1998). "Striga has pronounced effects on host growth and yield, which are substantially reduced....Quantification is difficult." It is estimated to occur on 40% of arable land and 67% of savanna zones under cereal production (Cochrane & Press, 1997). "There is considerable anecdotal evidence that farmers either abandon badly infested fields, or do not grow their preferred cereal" (Riches & Parker, 1995).	H	H
Impact quality?	The crops which are damaged most often...are oats, rice, teosinte, wheat, rye, sorghum, several of the millets (Italian, pearl, and finger), Sudan grass, corn, and sugarcane. Infestation of the last four crops-and occasionally of rice-causes the greatest economic losses. " Seed resembles dust (Holm, 1977). And usually infests grain crops. Unlikely to impact on quality.	L	MH
Affect land value?	"There is considerable anecdotal evidence that farmers either abandon badly infested fields, or do not grow their preferred cereal" (Riches & Parker, 1995). Non-host crops may be grown, but Striga "attacks grain crops in areas where few other food crops can be grown" (Musselman, 1980). The inability to grow preferred crops, or any crop at all is likely to have a major impact on land value.	H	MH
Change land use?	"A suitable crop rotation scheme instituted at the first appearance of the weed will seldom allow the infestation to become severe." There are Striga-tolerant strains of sugarcane & sorghum, but not of corn (Holm et al, 1977). "Attacks grain crops in areas where few other food crops can be grown" (Musselman, 1980). May cause a significant loss for agricultural usage.	H	MH
Increase harvest costs?	Several control measures have the potential to cause a major increase harvest costs, eg. applications of herbicides and/or germination stimulants; trap crops that need to be sown, grown and ploughed in; planting of Striga-tolerant strains (Musselman, 1980).	H	H
Disease host/vector?	Not noted in the extensive literature detailing the impact of this plant on agricultural systems.	L	H
		Impact Score	0.2466

Present distribution of *Striga asiatica* in Victoria

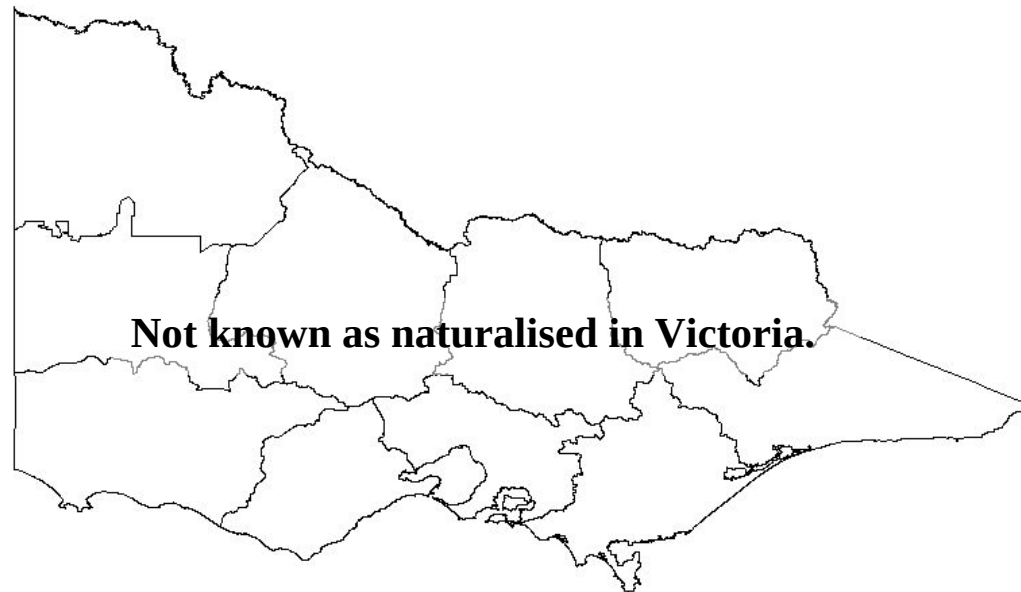
Scientific name: *Striga asiatica* L.

Common name(s): witchweed

Status:

Habitat:

Native of tropical and subtropical Africa and Asia. Primarily associated with agricultural lands, especially those with light soils. Prefers permanently disturbed habitats in open, sunny habitats.



Potential distribution of *Striga asiatica* in Victoria

Scientific name: *Striga asiatica* L.

Common name(s): witchweed

Status:

Habitat:

Native of tropical and subtropical Africa and Asia. Primarily associated with agricultural lands, especially those with light soils. Prefers permanently disturbed habitats in open, sunny habitats.

Potential distribution produced from CLIMATE modelling refined by applying suitable landuse and vegetation type overlays with CMA boundaries

MAP OVERLAYS USED.

Land Use:

Broadacre cropping

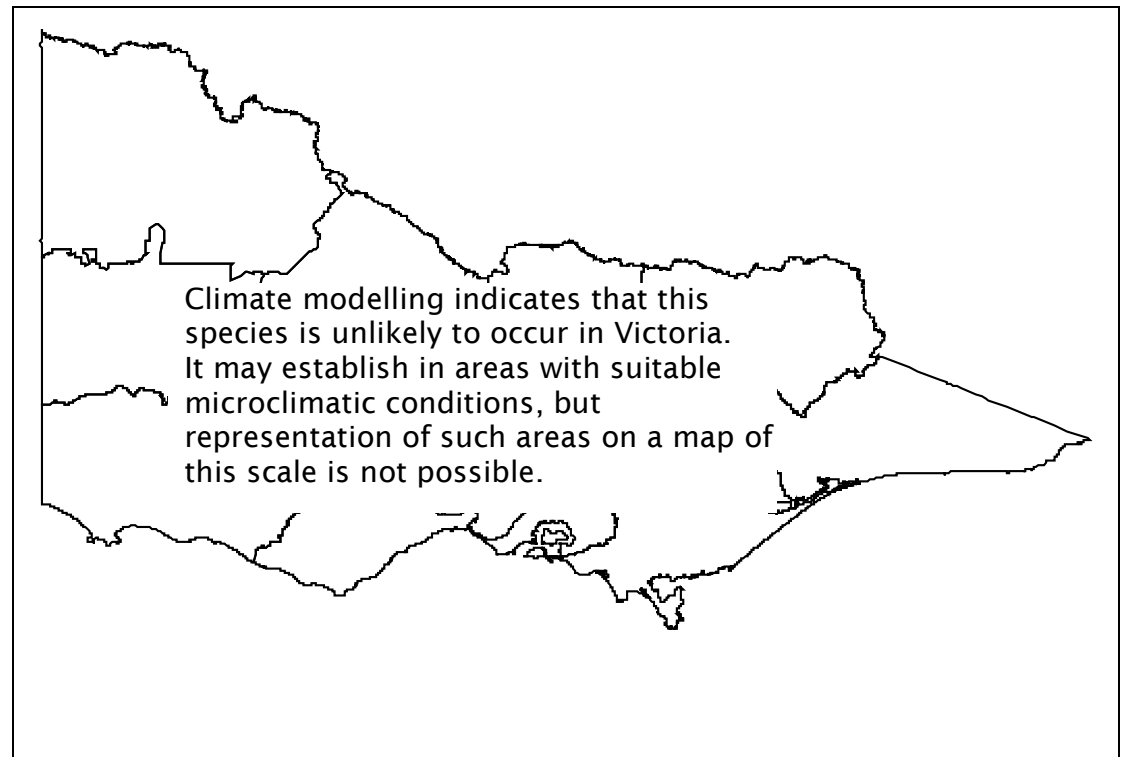
Broad vegetation types

Heathy woodland; swamp scrub; inland slopes woodland; sedge-rich woodland; montane dry woodland; grassland; plains grassy woodland; montane grassy woodland; rainshadow woodland; mallee; mallee heath; mallee woodland; wimmera/mallee woodland

Colours indicate possibility of *Striga asiatica* infesting these areas.

Red	= Very high	Yellow	= High
Orange	= Medium	Green	= Likely

In the non-coloured areas the plant is unlikely to establish as the climate, soil or landuse is not presently suitable.



Department of Primary Industries Weed Assessment Record

Scientific Name: *Toxicodendron radicans*

Common Name: poison ivy

Invasiveness

Establishment			
Question	Comments	Rating	Confidence
Germination requirements?	"Seeds germinating in spring produce a single vertical stem and fibrous roots," (Parsons & Cuthbertson 2001). Germination follows natural seasonal cycle.	MH	MH
Establishment requirements?	"Poison ivy is a common intruder into ruderal sites in North America, while in Japan, it is a component of old growth," (Pavek 1992). It is also known to establish as a "...primary dune colonizer, establishing before the xerophytic evergreen flora," (Cowles, cited in Pavek 1992). Seed found in mineral soil to depths of 10 cm were found to be germinable. (Artigas & Boerner, cited in Pavek 1992). Can establish under moderate canopy/litter cover.	MH	MH
How much disturbance is required?	In Australia, poison ivy occurs on disturbed sites in fields, pastures, thickets and waste places (Parsons & Cuthbertson 2001). In the U.S., where it is native, it occurs in naturally disturbed ecosystems such as riparian communities, and gallery forests, open woodlands, hillsides, sand dunes and lake shores. In urban areas it occurs on roadsides, stone walls, fences, clearcuts and orchards (Pavek 1992). Establishes in natural ecosystems subject to minor disturbance.	MH	MH

Growth/Competitive			
Question	Comments	Rating	Confidence
Life form?	Geophyte, climber (Pavek 1992)	ML	MH
Allelopathic properties?	None described. Pavek (1992) notes that literature on poison ivy inhibiting diameter growth of cottonwood species is conflicting. This comment relates to the physical restriction imposed by the vine around the trunk rather than any allelopathic effect.	L	MH
Tolerates herb pressure?	In the U.S. it is a common component of the winter diet for white-tailed deer with different authors ascribing the consumption of leaves or fruit as the source of fodder (Pavek 1992). Although it has properties that are highly toxic to humans, animals including birds, cattle, horses, sheep, goats and pigs are immune to poison ivy (Parsons & Cuthbertson 2001). Deciduous perennial vine with creeping rhizomes and aerial roots. Would survive browsing.	MH	MH
Normal growth rate?	"Poison ivy is an early competitor with other species that may become established in the overstory. Cowles (cited in Pavek 1992) notes that poison ivy is a primary dune coloniser, establishing before xerophytic evergreen flora.	H	MH
Stress tolerance to frost, drought, w/logg, sal. etc?	Poison ivy is found in swamps in the U.S., and can survive inundation and fluctuations in water levels, particularly seasonal variation (Pavek 1992). Rhizomatous perennial, not documented to be affected by frost. In the U.S., "Leaves are dropped after freezing temperatures in the fall," (Pavek 1992). Assume frost tolerant. "Poison ivy is top-killed by fire. Surviving rhizomes and root crowns will sprout to establish stands. Adams and others (cited in Pavek 1992) state that poison ivy was eliminated from sites after both summer and winter burning. "It is tolerant of brackish or mildly saline water," (Pavek 1992).	MH	MH

Reproduction			
Question	Comments	Rating	Confidence
Reproductive system	"Poison ivy reproduces vegetatively and sexually," (Pavek 1992)	H	MH

Department of Primary Industries Weed Assessment Record

Scientific Name: *Toxicodendron radicans*

Common Name: poison ivy

Reproduction			
Question	Comments	Rating	Confidence
Number of propagules produced?	No data published. Images from Duke University, Minnesota Tree Care Advisors and Massachusetts University show that fruit production is significant, potentially greater than 2000 seeds. (Fruits are single-seeded (Parsons & Cuthbertson 2001).	H	M
Propagule longevity?	No data. Pavék (1992) states that seeds have 'oily covering'. This may assist with extending the life of the seed.	L	L
Reproductive period?	No strong documented evidence. One horticultural web site suggests it is a long-lived plant. Perennial species that produces adventitious aerial roots. Lives longer than three years.	MH	ML
Time to reproductive maturity?	Pavék (1992) notes that in the U.S. reproductive maturity is reached after three years.	ML	MH
Dispersal			
Question	Comments	Rating	Confidence
Number of mechanisms?	"Spread is principally by seed. Birds and other animals readily eat the fruit," (Parsons & Cuthbertson 2001). The oily covering on the seed makes it bouyant, and it is suspected some seed is dispersed by water (Pavék (1992). Spread by birds.	H	MH
How far do they disperse?	No data. Birds consume fruit and disperse seed (Parsons & Cuthbertson 2001). In the U.S. crows are known to eat the fruit and regurgitate the seed (Pavék 1992), and this is likely to occur at distances of less than one kilometre. Also, grouse are known to consume the fruit, but the seed passes through the gut. Again, dispersal likely to be less than one kilometre.	MH	MH
Invasiveness Score			0.6905

Department of Primary Industries Weed Assessment Record

Scientific Name: *Toxicodendron radicans*

Common Name: poison ivy

Impact

Social			
Question	Comments	Rating	Confidence
Restrict human access?	Poison ivy grows as a shrub, sub-shrub or trailing vine (Parsons & Cuthbertson 2001). As a sub-shrub it may be a nuisance to humans seeking access to other areas. Contact with the sap can cause severe skin irritation, but this is dealt with in question 3.	L	MH
Reduce tourism?	It is known to be a dominant invasive in some open, disturbed areas. In a grassy woodland environment in the U.S. poison ivy was a principle invader reaching a cover density of 8% after 22 years. A deciduous species, it would be noticeable, particularly in autumn when the leaves provide a grand show of sanguine colours (davesgarden). Dense growth may affect the aesthetics for some visitors.	ML	M
Injurious to people?	"The sap of poison ivy causes severe dermatitis in humans," (Parsons & Cuthbertson 2001), as are the fruits and leaves toxic (Pavek 1992).	H	MH
Damage to cultural sites?	A deciduous creeper with perennial roots and adventitious aerial roots. Can grow to heights of 45 metres (Pavek 1992). Not recorded as causing structural damage. "The woody vine clings tightly to tree trunks," (Floridata). May damage culturally historic trees.	H	M

Abiotic			
Question	Comments	Rating	Confidence
Impact flow?	Parsons & Cuthbertson (2001) indicates poison ivy to be a terrestrial species, but in Florida, U.S., it is known to occur in mixed swamps and tolerate seasonal inundation, surviving due to presence of aerial roots (Pavek 1992). Does not affect water flow.	L	MH
Impact water quality?	Terrestrial species (Parsons & Cuthbertson 2001). Can occur in riparian zones, however, toxic properties of leaves/fruit not documented to affect water quality. Bees are known to produce a non-toxic honey from the nectar (Pavek 1992). Assume no impact on water quality.	L	MH
Increase soil erosion?	No evidence of affect on erosion. Parsons & Cuthbertson (2001) state the root system comprises a primary root stock that produces creeping rhizomes with fibrous roots from the nodes. Growing as a creeping subshrub the root system may provide for increased soil stability.	L	MH
Reduce biomass?	As a vine it would increase biomass. Subshrub/trailing plant; replace vegetation.	L	L
Change fire regime?	Pavek (1992) documents that, "Climbing vines of poison ivy form fuel ladders; fine fuels in ladders may be consumed in flare-ups." No direct data on flammability of poison ivy, trapped fuels may slightly increase fire intensity.	M	MH

Community Habitat			
Question	Comments	Rating	Confidence
Impact on composition High value EVC	EVC=Plains Grassy woodland (BCS = E); CMA=Glenelg Hopkins; Bioreg=Dundas Tablesand; CLIMATE potential=VH. It is known to be a dominant invasive in some open, disturbed areas. In a grassy woodland environment in the U.S. poison ivy was a principle invader reaching a cover density of 8% after 22 years. Grows to 15m (Parsons & Cuthbertson, 2001).	ML	M

Department of Primary Industries Weed Assessment Record

Scientific Name: *Toxicodendron radicans*

Common Name: poison ivy

Community Habitat			
Question	Comments	Rating	Confidence
Impact on composition Medium value EVC	EVC=Riparian Scrub (BCS =D); CMA=Glenelg Hopkins; Bioreg=Glenelg Plain; CLIMATE potential=VH. It is known to be a dominant invasive in some open, disturbed areas. In a grassy woodland environment in the U.S. poison ivy was a principle invader reaching a cover density of 8% after 22 years. Grows to 15m (Parsons & Cuthbertson, 2001).	ML	M
Impact on composition Low value EVC	EVC=Heathy woodland (BCS =LC); CMA=Glenelg Hopkins; Bioreg=Glenelg Plain; CLIMATE potential=VH. It is known to be a dominant invasive in some open, disturbed areas. In a grassy woodland environment in the U.S. poison ivy was a principle invader reaching a cover density of 8% after 22 years. Grows to 15m (Parsons & Cuthbertson, 2001).	ML	M
Impact on structure?	It is known to be a dominant invasive in some open, disturbed areas. In a grassy woodland environment in the U.S. poison ivy was a principle invader reaching a cover density of 8% after 22 years. Grows to 15m (Parsons & Cuthbertson, 2001).	MH	M
Effect on threatened flora?	No documented impact on threatened flora.	MH	L
Fauna			
Question	Comments	Rating	Confidence
Effect on threatened fauna?	No data. Its is demonstrated to be non- toxic to animals and birds and in the U.S. provides fodder for species of deer, grouse and crows (Pavek 1992).	M	M
Effect on non-threatened fauna?	As with effect on threatened fauna.	M	M
Benefits fauna?	May provide alternative food source for animals and seasonal harbour for some birds. "It provides a valuable harbour and food supply to wildlife," (Parsons & Cuthbertson 2001).	MH	MH
Injurious to fauna?	Not known to be harmful to animals. "Most animals including cattle, horses. sheep, goats, pigs and birds, are immune to poison ivy," (Parsons & Cuthbertson 2001)	L	MH
Pest Animal			
Question	Comments	Rating	Confidence
Food source to pests?	"It provides a valuable harbour and food supply to wildlife and a harbour to vermin," (Parsons & Cuthbertson 2001). Assume vermin also use plant as a food source (fruit).	ML	MH
Provides harbor?	"It provides a valuable harbour and food supply to wildlife and a harbour to vermin," (Parsons & Cuthbertson 2001).	ML	MH
Agriculture			
Question	Comments	Rating	Confidence

Department of Primary Industries Weed Assessment Record

Scientific Name: *Toxicodendron radicans*

Common Name: poison ivy

Agriculture			
Question	Comments	Rating	Confidence
Impact yield?	Parsons & Cutbertson (2001) state that poison ivy occurs in pasture, no evidence is available of affect on yield of grazing animals. Cattle and sheep are not affected by the plant. Wildlife consumes the plant; assume cattle and sheep readily consume the leaves with little or no effect on stocking rates.	L	MH
Impact quality?	See comments in question on yield. Little or no impact.	L	MH
Affect land value?	Not known as a serious agricultural weed. Regarding its properties, Parsons & Cuthbertson focus on harmful effects on humans rather than impact on agriculture. No effect on land value.	L	L
Change land use?	Although Parsons & Cuthbertson (2001) note that poison ivy occurs in pasture, it is not documented as a serious weed of agriculture either in Australia or elsewhere in the world. No effect.	L	MH
Increase harvest costs?	Not a weed of cropping.	L	MH
Disease host/vector?	No evidence.	M	L
Impact Score			0.2688

Present distribution of *Toxicodendron radicans* in Victoria

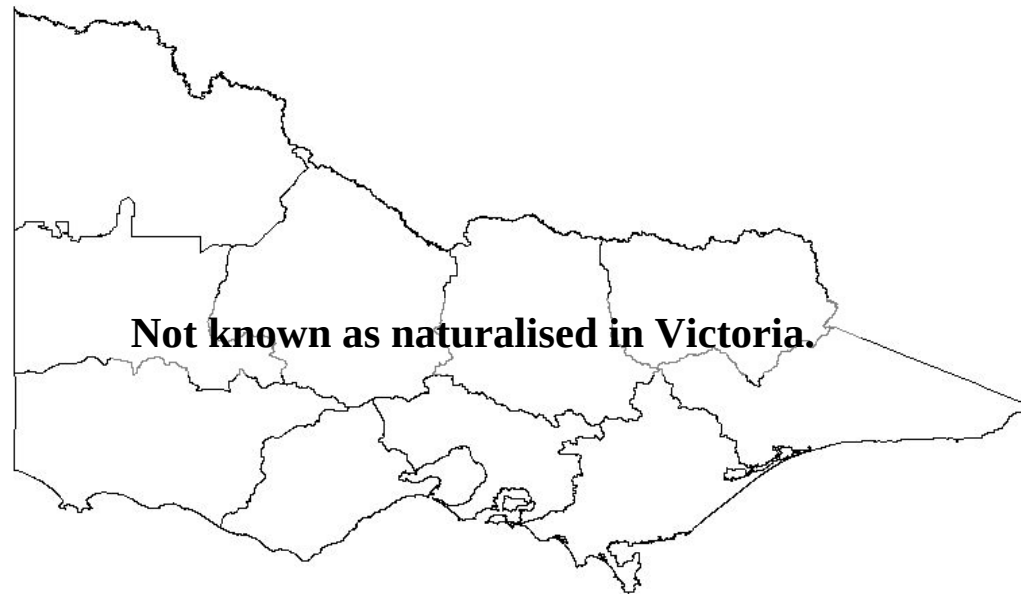
Scientific name: *Toxicodendron radicans* (L.) Kuntze

Common name(s): poison ivy

Status:

Habitat:

Found mainly in temperate regions on regularly disturbed, slightly alkaline to alkaline, sandy or stony soils in fields, pastures, thickets and waste places (Parsons & Cuthbertson 2001). Grows in semiarid to humid regions. Occurs most frequently on moist, open sites. Found in riparian communities, gallery forests, open dry or wet woods and hillsides (Pavek 1992).



Potential distribution of *Toxicodendron radicans* in Victoria

Scientific name: *Toxicodendron radicans* (L.) Kuntze

Common name(s): poison ivy

Status:

Habitat:

Found mainly in temperate regions on regularly disturbed, slightly alkaline to alkaline, sandy or stony soils in fields, pastures, thickets and waste places (Parsons & Cuthbertson 2001). Grows in semiarid to humid regions. Occurs most frequently on moist, open sites. Found in riparian communities, gallery forests, open dry or wet woods and hillsides (Pavek 1992).

Potential distribution produced from CLIMATE modelling refined by applying suitable landuse and vegetation type overlays with CMA boundaries

MAP OVERLAYS USED.

Land Use:

Forest private plantation; forest public plantation; pasture dryland;
pasture irrigation.

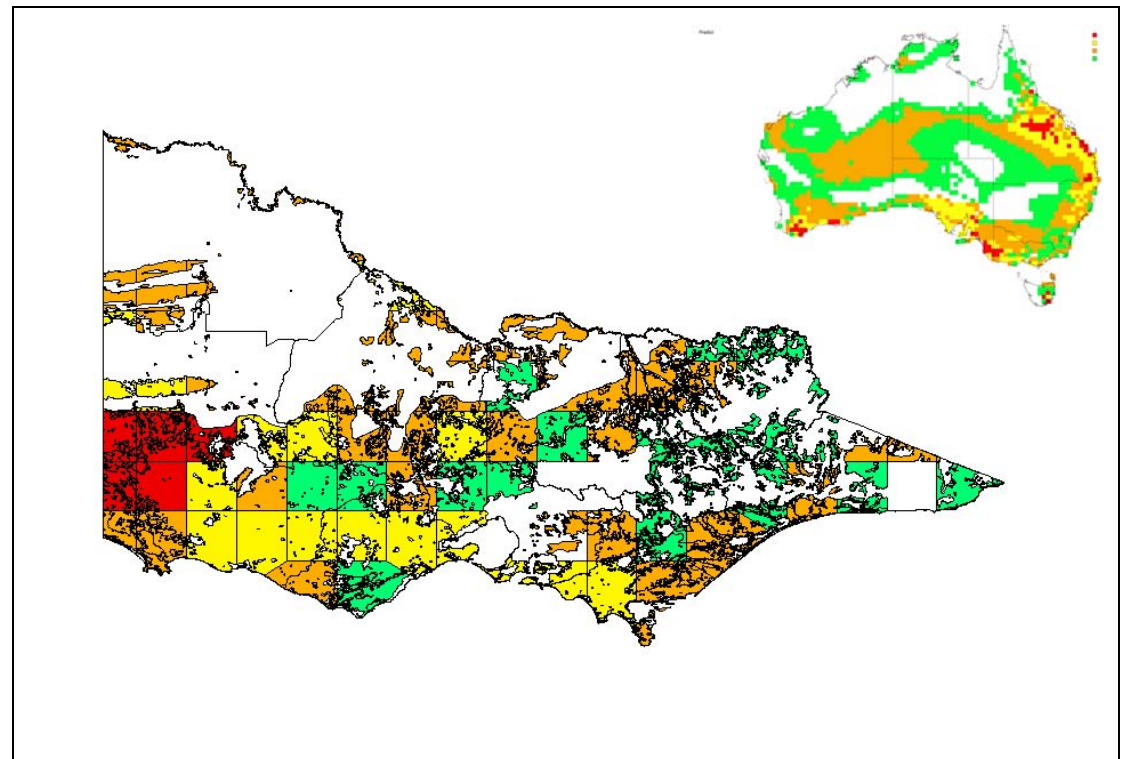
Broad vegetation types

Coastal scrubs and grassland; coastal grassy woodland; heathy woodland; lowland forest; swamp scrub; box ironbark forest; moist foothill forest; grassland; plains grassy woodland; valley grassy forest; riverine grassy woodland; riparian forest; mallee heath.

Colours indicate possibility of *Toxicodendron radicans* infesting these areas.

Red	= Very high	Yellow	= High
Orange	= Medium	Green	= Likely

In the non-coloured areas the plant is unlikely to establish as the climate, soil or landuse is not presently suitable.



Department of Primary Industries Weed Assessment Record

Scientific Name: *Wachendorfia thyrsiflora*

Common Name: bloodroot

Invasiveness

Establishment			
Question	Comments	Rating	Confidence
Germination requirements?	Seed is sown in Autumn (Notten, 2001); Spring (Bryan, 1989).	MH	M
Establishment requirements?	Full sun or semi-shade (Notten, 2001); full sun is needed (Bryan, 1989).	MH	MH
How much disturbance is required?	"Found spreading 'abundantly' along a drainage line in Victoria" (WWF, 2003). In its native range also found in natural areas that are prone to disturbance: swamps, marshes & shallow streams (Jeppe, 1989).	ML	MH

Growth/Competitive			
Question	Comments	Rating	Confidence
Life form?	Geophyte (Jesson & Barrett, 2002).	ML	H
Allelopathic properties?	This species produces phenylphenalenones that accumulate in their roots, which may be allelopathic, among many other biological functions (Opitz, 2002) but further research is required.	M	MH
Tolerates herb pressure?	"May be sampled [by deer] but should survive" (Guerzon, 2006).	MH	M
Normal growth rate?	"Multiplies rapidly" (Notten, 2001).	H	M
Stress tolerance to frost, drought, w/logg, sal. etc?	"Not hardy but able to withstand light but not prolonged periods of frost" (Bryan, 1989). Observed growing in a stream bed (Healy & Edgar, 1980). Requires permanently wet areas (Helme & Linder, 1992). Tolerates waterlogging and some frost, but not drought.	L	MH

Reproduction			
Question	Comments	Rating	Confidence
Reproductive system	"In aquatic habitats reproduce primarily by vegetative propagation," however also produces seed (Jesson & barrett, 2002).	H	H
Number of propagules produced?	Up to 638 flowers observed per plant. Average of 2.5 seeds produced per flower. 2.5 seeds x 638 flowers = 1595 seeds produced per plant.	MH	H
Propagule longevity?	Unknown	M	L
Reproductive period?	"A new rhizome is produced every year" (Helme & Linder, 1992).	H	H
Time to reproductive maturity?	Flowers can be expected from their 4th season (Notten, 2001). Corms will have formed by the second season (Bryan, 1989).	ML	M

Dispersal			
Question	Comments	Rating	Confidence

Department of Primary Industries Weed Assessment Record

Scientific Name: *Wachendorfia thyrsiflora*

Common Name: bloodroot

Dispersal			
Question	Comments	Rating	Confidence
Number of mechanisms?	Seeds float on water (Notten, 2001).	MH	M
How far do they disperse?	Seeds dispersed in water (Notten, 2001) are likely to be transported several hundred metres in flowing water.	MH	M
Invasiveness Score			0.6118

Department of Primary Industries Weed Assessment Record

Scientific Name: *Wachendorfia thyrsiflora*

Common Name: bloodroot

Impact

Social			
Question	Comments	Rating	Confidence
Restrict human access?	Plants can be 60-120cm tall (Bond & Goldblatt, 1984) and often many metres in diameter (Jesson & Barrett, 2002). Along waterways, such as swamps, marshes & shallow streams (Jeppe, 1989) large clumps may restrict human access.	ML	H
Reduce tourism?	Plants can be 60-120cm tall (Bond & Goldblatt, 1984) and often many metres in diameter (Jesson & Barrett, 2002), but unlikely to cause concern to the average visitor. Grown in gardens (Notten, 2001).	L	MH
Injurious to people?	Glabrous leaves not recorded as sharp or spiny (Helme & Linder, 1992). Not recorded as poisonous or irritant.	L	H
Damage to cultural sites?	Plants can be 60-120cm tall (Bond & Goldblatt, 1984) and often many metres in diameter (Jesson & Barrett, 2002), but unlikely to cause concern to the average visitor. Grown in gardens (Notten, 2001).	L	MH

Abiotic			
Question	Comments	Rating	Confidence
Impact flow?	No data	M	L
Impact water quality?	No data	M	L
Increase soil erosion?	Perennial, rhizomatous plant (Helme & Linder, 1992) is likely to reduce the risk of erosion.	L	MH
Reduce biomass?	unknown	M	L
Change fire regime?	In the swamp, marshes and shallow streams (Jeppe, 1989) that this plant is confined to (Helme & Linder, 1992), fire is unlikely to occur.	L	H

Community Habitat			
Question	Comments	Rating	Confidence
Impact on composition High value EVC	Basin=Wimmera-Avon Rivers (ISC=insufficient data); CMA=; CLIMATE potential=VH. A single plant may be many metres in diameter (Jesson & Barrett, 2002). Perennial to 2.5m tall (Helme & Linder, 1992). Often dominant in marshes (Helme & Linde, 1992). May have a major effect on the lower strata.	MH	H
Impact on composition Medium value EVC	All Victorian waterbodies are presumed to be high value EVCs.	L	H
Impact on composition Low value EVC	All Victorian waterbodies are presumed to be high value EVCs.	L	H

Department of Primary Industries Weed Assessment Record

Scientific Name: *Wachendorfia thyrsiflora*

Common Name: bloodroot

Community Habitat			
Question	Comments	Rating	Confidence
Impact on structure?	A single plant may be many metres in diameter (Jesson & Barrett, 2002). Perennial to 2.5m tall (Helme & Linder, 1992). Often dominant in marshes (Helme & Linde, 1992). May have a major effect on the lower strata.	MH	H
Effect on threatened flora?	No evidence found.	MH	L
Fauna			
Question	Comments	Rating	Confidence
Effect on threatened fauna?	No data	MH	L
Effect on non-threatened fauna?	No data found.	M	L
Benefits fauna?	May be eaten by deer (Guerzon, 2006) and may provide food for other herbivores.	MH	M
Injurious to fauna?	Glabrous leaves not recorded as sharp or spiny (Helme & Linder, 1992). Not recorded as poisonous or irritant.	L	MH
Pest Animal			
Question	Comments	Rating	Confidence
Food source to pests?	May be eaten by deer (Guerzon, 2006).	ML	M
Provides harbor?	Plants can be 60-120cm tall (Bond & Goldblatt, 1984) and often many metres in diameter (Jesson & Barrett, 2002). Large clumps may harbor pests.	ML	H
Agriculture			
Question	Comments	Rating	Confidence
Impact yield?	No evidence that agricultural systems are impacted. Confined to permanently wet areas (Helme & Linder, 1992).	L	H
Impact quality?	No evidence that agricultural systems are impacted. Confined to permanently wet areas (Helme & Linder, 1992).	L	H
Affect land value?	No evidence that agricultural systems are impacted. Confined to permanently wet areas (Helme & Linder, 1992).	L	H
Change land use?	No evidence that agricultural systems are impacted. Confined to permanently wet areas (Helme & Linder, 1992).	L	H
Increase harvest costs?	No evidence that agricultural systems are impacted. Confined to permanently wet areas (Helme & Linder, 1992).	L	H
Disease host/vector?	No evidence that agricultural systems are impacted.	L	L

Department of Primary Industries Weed Assessment Record

Scientific Name: *Wachendorfia thyrsiflora*

Common Name: bloodroot

Impact Score

0.2892

Present distribution of *Wachendorfia thyrsiflora* in Victoria

Scientific name: *Wachendorfia thyrsiflora* Burm.

Common name(s): bloodroot

Status:

Habitat:

Native to Southern Africa. Found in swamps, marshes and shallow streams .. usually in habitats with standing water (Jesson & Barrett 2002). Confined to permanently moist sites. Fynbos (Thuiller *et al* 2005).



Potential distribution of *Wachendorfia thyrsiflora* in Victoria

Scientific name: *Wachendorfia thyrsiflora* Burm.

Common name(s): bloodroot

Status:

Habitat:

Native to Southern Africa. Found in swamps, marshes and shallow streams .. usually in habitats with standing water (Jesson & Barrett 2002). Confined to permanently moist sites. Fynbos (Thuiller *et al* 2005).

Potential distribution produced from CLIMATE modelling refined by applying suitable landuse and vegetation type overlays with CMA boundaries

MAP OVERLAYS USED.

Land Use:

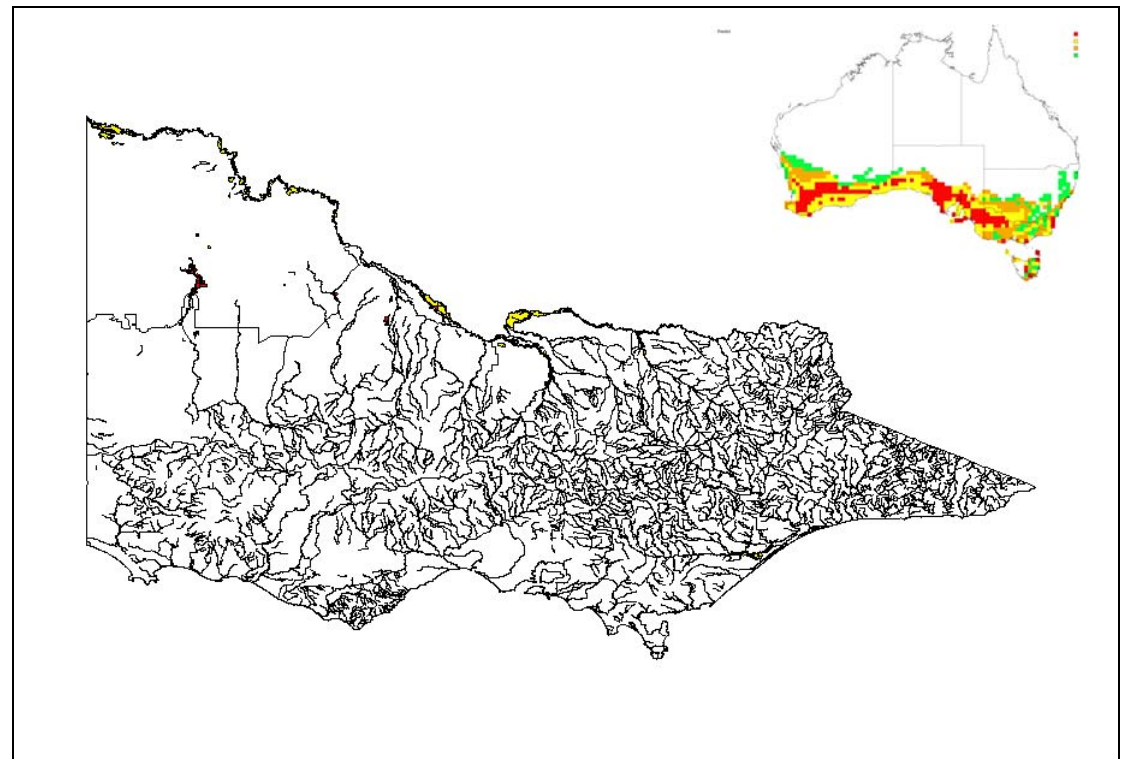
Broad vegetation types

Swamp scrub; riverine grassy woodland

Colours indicate possibility of *Wachendorfia thyrsiflora* infesting these areas.

 Red	= Very high	 Yellow	= High
 Orange	= Medium	 Green	= Likely

In the non-coloured areas the plant is unlikely to establish as the climate, soil or landuse is not presently suitable.



References for Victorian Alert Weeds

- Agriculture and Resource Management Council of Australia & New Zealand, Australian & New Zealand Environment & Conservation Council and Forestry Ministers, (2000) *Weeds of National Significance Cambomba (Cabomba caroliniana) Strategic Plan*. National Weeds Strategy Executive Committee, Launceston.
- Agriculture and Resource Management Council of Australia & New Zealand, Australian & New Zealand Environment & Conservation Council and Forestry Ministers, (2001) *Weeds of National Significance Athel Pine (Tamarix aphylla) Strategic Plan*. National Weeds Strategy Executive Committee, Launceston.
- Albrecht D, Colville B, Entwisle T, Jones D, Lorimer G, Mattingley G & Weste G (eds.) 1991, *Flora of Melbourne*, Society for Growing Australian Plants Maroondah, inc.
- Alper. J. 2004, 'Wicked weed of the west', *Smithsonian*, vol. 35, no. 9, pp. 33-35, viewed 02 Dec 2005, ProQuest database.
- Ambika, S.R. & Jayachandra 2001, *The problem of Chromolaena weed*, *Chromolaena odorata*, Biocontrol in the tropics, Charles Darwin University, Darwin, viewed 11 Nov 2005, <http://www.ehs.cdu.edu.au/chromolaena/pubs/problem.html>
- Anderson, R.L., ball, D., Wicks, G., Lyon, D., Donald, W.W., Miller, S. 2002, *Jointed goatgrass ecology bulletin*, Washington State University Extension Service, Jointed Goatgrass Symposium, viewed 17 Feb 2006, http://www.ars.usda.gov/research/publications/Publications.htm?seq_no_115=130909
- Anon. 2005, *Missouri Botanical Garden*, USA, viewed 30/08/2005, http://mobot.mobot.org/cgi-bin/search_vast.
- Australia's Virtual Herbarium Online: <http://www.rbg.vic.gov.au/avh/>. Viewed 26 June 2006.
- Backyard Gardener n.d. *Carex buehneri* (leatherleaf sedge), BackyardGardener.com, viewed 21 June 2006, http://www.backyardgardener.com/planname/pda_be75.html
- Bass, D. 2002, *Asparagus declinatus*, Weeds CRC, Environmental Weeds Archives, viewed 10 May 2006, http://www.weeds.crc.org.au/cropweeds/crop_weeds_a.html
- Bass, D.A. and Lawrie, S. L. 2003, *Impacts, dispersal, predictive modelling and control of bridal veil*, Environmental Weeds Group, School of Geography, Population and Environmental Management, Flinders University, Adelaide
- Bais, H.P., Vepachedu, R., Gilroy, S., Callaway, R.M. and Vivanco, J.M. 2003, 'Allelopathy and exotic plant invasion: from molecules and genes to species information', *Science*, vol. 301, no. 5638, pp. 1377, viewed 03 Dec 2005, ProQuest database.
- Beckmann, R. 1990. *Athels inland*. Ecos 63, Autumn 1990. Available: http://www.publish.csiro.au/ecos/view/dsp_download.cfm?article_id=EC63p18.pdf&issue_id=63&issue_year=1990 Accessed 08/07/03
- Bell, T.L. & Ojeda, F. 1999, 'Underground starch storage in Erica species of the Cape floristic region- differences between seeders and resprouters,' *New Phytology*, vol. 144, p. 143-152.
- Benson, L. 1982, *The cacti of the United States and Canada*, Stanford University Press, California.
- Bilowol, J 2005, Devastating plant threatens coast, *The Australian* [online] 10 November, viewed 11 Nov 2005, http://www.theaustralian.news.com.au/common/story_page/0,5744,15891895%255E30417,00.html
- Blood, K., Victorian Department of Primary Industries, Environmental Weeds Education Coordinator

- Bond, P. & Goldblatt, P. Plants of the Cape flora, Trustees of the National Botanic Gardens of South Africa.
- Bossard, C.C., and Rejmanek, M., 1994, Herbivory, growth, seed production and resprouting of an exotic invasive shrub *Cytisus scoparius*, *Biological Conservation*, Vol: 67, No: 3, pp 193–200
- Briese DT, Sheppard AW & Reifenberg JM 1995, Open-field host-specificity testing for potential biological control agents of *Onopordum* thistles,' *Biological Control*, Vol. 5, p. 158-166.
- Britton, N.L. and Rose, J.N. 1919, *The cactaceae: descriptions and illustrations of plants of the cactus family*, Carnegie Institution, Washington.
- Brooks, M.L., D'Antonio, M., Richardson, D.M., Grace, J.B., Keeley, J.E., DiTomaso, J.M., Hobbs, R.J., Pellant, M. and Pyke, D. 2004, 'Effects of invasive alien plants on fire regimes', *BioScience*, vol. 54, no. 7, pp. 677-688.
- Bryan, J.E. 1989, *Bulbs*, vol II, 1-2, Timber Press, Portland.
- Bungard, R.A., Daly, G.T., McNeil, D.L., Jones, A.V. & Morton, J.D. 1997, '*Clematis vitalba* in a New Zealand native forest remnant: does seed germination explain distribution?', *New Zealand Journal of Botany*, vol. 35, pp. 525-534.
- Callaway, R.M., DeLuca, T.H. and Belliveau, W.M. 1999, 'Biological-control herbivores may increase competitive ability of the noxious weed *Centaurea maculosa*', *Ecology*, vol. 80, no. 4, pp. 1196-1201, viewed 02 Dec 2005, ProQuest database.
- Calvo, L., Santalla, S., Marcos, E., Valbuena, L., Tarrega, R. and Luis, E. 2003, 'Regeneration after wildfire in communities dominated by *Pinus pinaster*, an obligate seeder, and in others dominated by *Quercus pyrenaica*, a typical resprouter', *Forest Ecology and Management*, vol. 184, no. 1, pp. 209-223.
- Canadian Poisonous Plants Information System (CPPIS) 2005, *Notes on poisoning: Ornithogalum umbellatum*, Canadian Biodiversity Information Facility, viewed 11 Nov 2005, http://www.cbif.gc.ca/pls/pp/ppack.info?p_null=Ornithogalum+umbellatum&p_type=all&p_sci=sci
- Carr, G.W., Yugovic, J.V. and Robinson, K.E. 1992, *Environmental weed invasions in Victoria: Conservation and management implications*, Department of Conservation and Natural Resources and Ecological Horticulture, Victoria.
- Chapman, H.M. and Bannister, P. 1994, 'Vegetative reproduction and performance of *Calluna vulgaris* in New Zealand, with particular reference to Tongariro National Park', *New Zealand Journal of Ecology*, vol. 18, no. 2, pp. 109-121, viewed 30 Nov 2005, http://www.nzes.org.nz/nzje/free_issues/NZJEcol18_2_109.pdf
- Clarke, R. 1999, *Diseases of lucerne – 2: Fungal leaf diseases*, Agricultural Notes, AG 0727, Department of Primary Industries, Victoria.
- Clayton, W.D., Harman, K.T. and Williamson, H. (2002 onwards). World Grass Species: Descriptions, Identification, and Information Retrieval, viewed: 29/06/2006, <http://www.kew.org/data/grasses-db.html>
- Collins, K. 2006, 'Carex', *Horticulture Week*, Apr 6, 2006, pp. 18-19, Proquest database.
- Colorado Natural Areas Program (CNAP) 2000, *Creating an integrated weed management plan: a handbook for owners and managers of lands with natural values*, Colorado Natural Areas Program, Colorado State Parks, Colorado Department of Natural Resources; and Division of Plant Industry, Colorado Department of Agriculture. Denver, Colorado, viewed 10 April 2006, http://parks.state.co.us/cnap/IWM_handbook/IWM_index.htm
- Colorado Weed Management Association n.d., *Spotted knapweed*, Colorado Natural areas program, Colorado Weed Management Association, viewed 02 Dec 2005, http://www.cwma.org/nx_plants/spot2.htm

CRC for Australian Weed Management (Weeds CRC) 2003, *Weed management guide - Bridal creeper* (*Asparagus asparagoides*), CRC for Australian Weed Management and Commonwealth Department of Environment and Heritage, viewed 22 May 2006, http://www.weeds.crc.org.au/documents/wmg_bridal_creeper.pdf

CRC for Australian Weed Management 2003, *Weed management guide: Heather* (*Calluna vulgaris*), CRC for Australian Weed Management and the Commonwealth Department of the Environment and Heritage, viewed 30 Nov 2005, http://www.weeds.crc.org.au/documents/wmg_heather.pdf

CRC for Weed Management 2003, '*Weed management guide: Siam weed or chromolaena* (*Chromolaena odorata*), CRC for Australian Weed Management, Commonwealth Department of Environment and Heritage, viewed 09 Nov 2005, http://www.weeds.crc.org.au/documents/wmg_siam_weed.pdf

CRC for Australian Weed Management 2003, *Weed management guide, Senegal tea plant* (*Gymnocoronis spilanthoides*), CRC for Australian Weed Management and the Commonwealth Department of Environment and Heritage, viewed 23 Jan 2006, http://www.weeds.crc.org.au/documents/wmg_senegal_tea.pdf

CRC Weed Management 2003, *Weed Management Guide- Leaf cactus* – *Pereskia aculeata*, CRC Weed Management, Australia.

CRC Weed Management 2003, *Weed Management Guide- Piptochaetium montevidense*- Uruguayan rice grass, CRC Weed Management, Australia.

CRC Weed Management 2003a, *Weed Management Guide: Uruguayan rice grass* – *Piptochaetium montevidense*, Australia.

CRC Weed Management 2003b, *CRC Weed Management*, Cooperative Research Centres Association, Canberra, viewed: 12/10/2005, www.weeds.crc.org.au/main/wom_uruguayan_0405.htm.

CRC Weed Management 2003, *Weed Management Guide- White weeping broom* - *Retama raetam*, CRC Weed Management, Australia.

CRC Weed Management 2003, *Weed Management Guide- White weeping broom* - *Retama raetam*, CRC Weed Management, Australia.

Crescent Bloom 2004, *Euphorbia cyparissias*, Crescent Bloom, California, viewed 10 April 2006, <http://www.crescentbloom.com/Plants/Specimen/EU/Euphorbia%20cyparissias.htm>

Csurhes S & Edwards R 1998, *Potential Environmental Weeds in Australia, Candidate Species for Preventative Control*, Biodiversity Group, Environment Australia, Canberra, ACT.

Cunningham, D.C., Woldendorp, G., Burgess, M.B. and Barry, S.C. 2004, *Prioritising sleeper weeds for eradication: selection of species based on potential impacts on agriculture and feasibility of eradication*, Bureau of Rural Sciences, Canberra, viewed 19 April 2006, <http://affashop.gov.au/product.asp?prodid=12919>

d'Arces PJ 1961, 'A contribution to the study of sheep-feeding in Algeria,' *C. R. Acad. Agric. Fr.*, vol 47(12). P. 630-7.

Davis, PH (ed) 1975, *Flora of Turkey*, University Press, Edinburgh.

de Beer H 1988, 'Pereskia,' *Farming in South Africa, Weed Series*, Agricultural Research Council, South Africa.

Department of Conservation (DOC) 2003, *Chilean rhubarb*, WeedBusters News, Department of Conservation, Wellington, viewed 13 Oct 2005, http://www.weedbusters.org.nz/news/news_articles/news01.asp?NewsID=8

Department of Conservation (DOC) 2004, *Rostrivior Pastoral Lease*, Conservation Resources Report.

Department of Conservation 2005, *Plant me instead*, Department of Conservation, Wellington Conservancy, New Zealand.

- Defense Environmental Network and Information Exchange (DENIX) n.d., Plant invasions: Croplands, Invasive Plants Facts Book, viewed 20 Feb 2006, <https://www.denix.osd.mil/denix/Public/ES-Programs/Conservation/Invasive/croplands.html>
- Dellafore, C Munoz Valles, S and Gallego Fernandez, J 2006, Rabbits (*Oryctolagus cuniculus*) as dispersers of *Retama monosperma* (L.) Bois seed in a coastal dune system, *Ecoscience* Vol. 13 Iss. 1 pp 5-10
- Department of Conservation, n.d., Adding a bit of colour, Department of Conservation, Te Papa Atawhai, New Zealand, viewed 30 Nov 2005,
- Department of Natural Resources and Mines 2005a, *Siam weed: Chromolaena odorata*, Department of Natural Resources and Mines, Queensland Government, Brisbane, viewed 09 Nov 2005, http://www.nrm.qld.gov.au/pests/weeds/declared_plants/siam_weed.html
- Department of Primary Industries and Fisheries (DPIF) 2005, Emerging plant pests: Wheat streak mosaic virus, DPIF note, Qld, viewed 20 Feb 2006, <http://www2.dpi.qld.gov.au/health/12407.html>
- Donald, W.D. and Ogg, A.G. Jnr 1991, 'Biology and control of jointed goatgrass (*Aegilops cylindrica*), a review', *Weed Technology*, vol. 5, pp. 3-17.
- Dlugosch, K. 2004, *Hypericum canariense* (*Canary Island St Johnswort*), University of California, Santa Cruz, viewed 10 Jan 2006, <http://bio.research.ucsc.edu/people/parker/hypericum/>
- El-Bana M, Jijs I & Khedr AA 2003, 'The importance of Phytogenic Mounds (Nebkhas) for Restoration of Arid Degraded Rangelands in Northern Sinai,' *Restoration Ecology*, vol. 11(3), p. 317-324.
- El Bahri L, Djegham M & Bellil H 1999, '*Retama raetam* W: A poisonous plant of North Africa,' *Veterinary & Human Toxicology* Vol. 41(1), p. 33-35.
- Faubert, H. and Casagrande, R.A. 2002, *Cypress spurge*, Biological control of invasive plants in the Eastern United States, USDA Forest Service, viewed 22 Nov 2005, <http://www.invasive.org/eastern/biocontrol/15CypressSpurge.html>
- Faucon P 2005, Desert Tropicals, Philippe and Sura Faucon, USA, Viewed: 12/10/2005, www.desert-tropicals.com/Plants/Cactaceae/Pereskia_aculeata.html
- Fishel, F. 2001, 'Star-of-Bethlehem makes its arrival', *Integrated Crop and Pest Management Newsletter*, vol. 11. No. 4, viewed 14 June 2006, <http://ipm.missouri.edu/ipcm/archives/v11n4/ipmnews.txt>
- Flora of North America Editorial Committee, (FNAEC) eds. 1993, *Flora of North America North of Mexico*, vol. 26 New York and Oxford.
- Flora of North America (FNA) 2004, *Cylindropuntia tunicata*, eFloras database, viewed 10 Dec 2005, http://efloras.org/florataxon.aspx?flora_id=1&taxon_id=242415152
- Focht T & Pillar VD 2003, 'Spatial patterns and relations with site factors in a campos grassland under grazing,' *Brazilian Journal of Botany*, v. 63(3) p. 423-436.
- Forest Service 2003, *Tamarix aphylla*, United States Department of Agriculture Forest Service, Washington, viewed: 09 July 2005, <http://www.fs.fed.us/database/feis/plants/tree/tamaph/>
- Germplasm Resource Information Network. Online: http://www.ars-grin.gov/cgi_bin/npgs/html/taxon.pl?311145Ghafoor, A. 1977, 'Zygophyllaceae' in Jafri, S.M.H. and El-gadi, A., *Flora of Libya*, vol. 38, Al Fateh University, Faculty of Science, Department of Botany.
- Guerzon, A. 2006, Deer Resistant Plants, Lan Lorenzo Garden Centre, California, viewed: 14/06/2006, www.sanlorenzolumber.com/garden/pdf/Deer_Resistant_List.pdf

- Goetz, R.J., Jordan, T.N., McCain, J.W. and Su, N.Y. 2000, *Indiana plants poisonous to livestock and pests*, Cooperative Extension Service, Purdue University, West Lafayette, viewed 10 Apr 2006, <http://www.vet.purdue.edu/depts/addl/toxic/cover1.htm>
- Groves, R.H., Moerkerk, M., Blakey, D., & Moore, P.H. 2002 'Taurian thistle in Australia – a candidate for eradication?' *Thirteenth Australian Weeds Conference*, p. 287-288.
- Groves, R.H. (Convener) Hosking, J.R. Batianoff, G.N. Cooke, D.A. Cowie, I.D. Johnson, R.W. Keighery, G.J. Lepschi, B.J. Mitchell, A.A. Moerkerk, M. Randall, R.P. Rozefelds, A.C. Walsh, N.G. & Waterhouse, B.M. 2003, *Weed Categories for Natural and Agricultural Ecosystem Management*, Bureau of Rural Sciences, Canberra.
- Hansford, M. & Iaconis, L.J. 2004, 'Early intervention action on Canary Island St. Johns wort, *Hypericum canariense* L. in Victoria', *In*: B.M. Sindel & S. B. Johnson eds, , in *Fourteenth Australian Weeds Conference*, 6-9 September, Wagga Wagga, R.G. & F.J. Richardson, Melbourne, pp. 469 – 471.
- Healy, A.J & Edgar, E. 1980, *Flora of New Zealand*, vol. 3, Government Printer, New Zealand.
- Healy, E.A., Enloe, S & JM DiTomaso 2005, *California Department of Food and Agriculture*, USA, viewed: 06/12/2005, <http://www.cdffa.ca.gov/phps/ipc/weedinfo/onopordum.htm>.
- Heather Society 2006, *Handy Guide to Heathers*, viewed:28/06/2006, www.users.zetnet.co.uk/heather/handy-guide.html.
- Hegazi, E. M. & Moursi, K.S. 1983, 'Studies on distribution and biology of the capsule fly *Acanthiophilus helianthi* Rossi on wild plants in Egyptian Western Desert', *Zeitschrift fur Angewandte Entomologie*, vol. 96, no. 4, pp. 333-336, viewed 06 Dec 2005, CAB abstract database.
- Helme, N.A. & Linder, H.P. 1992, 'Morphology, evolution and taxonomy of *Wachendorfia* (Haemodoraceae),' *bothalia*, vol. 22(1), pp. 59-75.
- Henderson L 2001, *Alien Weeds and Invasive Plants*, Agricultural Research Council, South Africa.
- Heringer, I & Jacques, A.V.A. 2002, 'Burning and management alternatives non floristic composition of native pasture,' *The Scientific Journal of the Agricultural Centre*, Federal University of Santa Maria, Brazil, p. 315-321.
- Hilty, J. 2004, *Weedy wildflowers of Illinois: Star-of-Bethlehem*, Illinois Wildflowers, viewed 13 June 2006, <http://www.illinoiswildflowers.info/weeds/plants/starbeth.htm>
- Holloway, G. and Bedggood, W. 2003, *Information notes: Rusts of barley*, Victorian Institute for Dryland Agriculture, Department of Primary Industries, viewed 14 June 2006, <http://www.dpi.vic.gov.au/dpi/nreninf.nsf/childdocs/-22C871BE2A0105794A2568B30004D413-19BEB5ECB3BFD81BCA256BC70082428C-059A2ABB859C24FC4A256DEA002756E9-FC12E4D8B8736B23CA256CF7000B0281?open>
- Holm, L., Pancho, J. V., Herberger, J.P. & Plucknett, D.L. 1979, *A geographical atlas of world weeds*, John Wiley & Sons, New York.
- Holst P.J. & Allan C.J. 1996, 'Targetted grazing of thistles using sheep and goats,' *Plant Protection Quarterly*, vol. 11(supplement 2), pp. 271-273.
- Hosking, J. 2006, '*Cylindropuntia tunicata* and *Cylindropuntia rosea*', *Cunninghamia* (In press).
- Hosking, J.R. Conn, B.J. & Lepschi, B.J. 2003, 'Plant species first recognised as naturalised for New South Wales over the period 2000–2001,' *Cunninghamia* 8(2): 175-187.
- Hussain, F., Nasrin, R. and Yasmin 1988, 'Allelopathic potential of harmal', *Pakistan Journal of Scientific and Industrial Research*, vol. 31, no. 4, pp. 293-296. CAB Abstracts.
- Institute of Medicine 2005, *Dietary supplements: a framework for evaluating safety*, National Academies Press, Washington.

- Invasive Species Specialist Group 2000, *Chromolaena odorata* (herb), Global Invasive Species Database, Auckland, viewed 09 Nov 2005, <http://www.issg.org/database/species/ecology.asp?si=47&fr=1&sts=>
- Invasive Species Specialist Group (ISSG) 2004, *Heracleum mantegazzianum* (herb), Global Invasive Species Database, viewed 13 Oct 2005, <http://www.issg.org/database/species/ecology.asp?si=418&fr=1&sts=sss>
- Invasive Species Specialist Group 2005, *Cabomba caroliniana* (aquatic plant), Global Invasive Species Database, The World Conservation Union, viewed 28 July 2005, <http://www.issg.org/database/species/ecology.asp?si=402&fr=1&sts=sss>
- Invasive Species Specialist Group (ISSG) 2005, *Clematis vitalba*, Global Invasive Species Database, viewed 11 Oct 2005, <http://www.issg.org/database/species/ecology.asp?si=157&fr=1&sts=sss>
- Invasive Species Specialist Group (ISSG) 2005, *Gunnera tinctoria* (herb), Global Invasive Species Database, viewed 13 Oct 2005, <http://www.issg.org/database/species/ecology.asp?si=836&fr=1&sts=sss>
- Jacobs, S.W.L., Everett, J., Connor, H.E. and Edgar, E. 1989, 'Stipoid grasses in New Zealand', *New Zealand Journal of Botany*, vol. 27, pp. 569-582.
- Jacobsen, E 2000, *Retama monosperma* Bailey in Invasive plants of California's wildlands, ed. C Bossard, J Randall & M Hoshovsky, University of California Press
- Johnson MB 2005, *Desert Legume Program*, University of Arizona College of Agriculture and Life Sciences, and the Boyce Thompson Southwestern Arboretum, Arizona, viewed: 29/12/2005, <http://cals.arizona.edu/desertlegumeprogram/pdf/Survival.pdf>.
- Jeppe, B. 1989, *Spring & Winter flowering bulbs of the Cape*, Oxford Uni Press, Cape Town.
- Jesson L.K. & Barrett C.H. 2002, 'Enantiostyly in *Wachendorfia thyrsiflora* (Haemodoraceae): the influence of reproductive systems on the maintenance of the polymorphism,' *American Journal of Botany*, vol. 89, p. 253-262.
- Johnson MB 2005, *Desert Legume Program*, University of Arizona College of Agriculture and Life Sciences, and the Boyce Thompson Southwestern Arboretum, Arizona, viewed: 29/12/2005, <http://cals.arizona.edu/desertlegumeprogram/pdf/Survival.pdf>.
- Jordan, M.J., Lund, B. and Jacobs, W.A. 2002, *Effects of mowing, herbicide and fire on Artemisia vulgaris, Lespedeza cuneata and Euphorbia cyparissias at the Hempstead Plains grassland*, Long Island, New York, Northeast Natural History Conference, April 25-26 2002.
- Kettenring, K. and Galatowitsch, S. 2004, 'Germination and dormancy cycling in 10 *Carex* spp.: Implications for prairie wetland restoration', Ecological Society of America, Annual General Meeting, Oral Session 12: Restoration Ecology 1: Streams and Wetlands, viewed 22 June 2006, <http://abstracts.co.allenpress.com/pweb/esa2004/document/?ID=35584>
- Klein, H. 2002, *Indigenous and alien plants*, ARC – Plant Protection Research Institute, viewed 28 Apr 2006, <http://www.arc.agric.za/institutes/ppri/main/divisions/weedsdiv/alienplants/indigenous.htm>
<http://knitagarden.typepad.com/knitagarden/2006/04/index.html>
- Kriticos, D.J., Yonow, T. & McFayden, R.E. 2005, 'The potential distribution of *Chromolaena odorata* (Siam weed) in relation to climate', *Weed Research*, vol. 45, pp. 246-254.
- Laity, M. 2005, 'Chemical control of cacti can be a prickly issue', *Under Control*, no. 32, p. 14.

- Leslie, J. 2001, *Journal Watch: Invasive plants threaten Nile crocodile*, Conservation in Practice, vol. 2, no. 3, viewed 09th Nov 2005, <http://www.conbio.org/cip/article23inv.cfm>
- Lethbridge, M.B. 2005, 'Using an individual-based stochastic simulation modelling and GIS to explore dispersal mechanisms, management strategies and the associated invasion risk of Bridal Veil (*Asparagus declinatus*)', Honours thesis abstract, Flinders University, Adelaide, viewed 10 May 2005.
- Leuenberger, BE 1986, '*Pereskia* (Cactaceae),' *Memoirs of the New York botanical Garden*, Vol. 41, p. 1-141.
- Liang W & Steinberger Y 2001, 'Tempotal changes in nematode community structure in a desert ecosystem,' *Journal of Arid Environments*, Vol. 48(3), p. 267-280.
- Linder, H.P. 1991 Tthe Ericoideae (Ericaceae)- A Review,' in Linder, H.P. & Hall, A.V. (eds.), Systematics, Biology and Evolution of some Soth African Taxa, Bolus Herbarium, University of Cape Town, Rondebosch, South Africa.
- Mabberley, D.J. 1997, *The plant book: a portable dictionary of the vascular plants*, 2nd ed., Cambridge University Press, Great Britain.
- McBride, J. and Heady, H.F. 1968, 'Invasion of grassland by *Baccharis pilularis* DC.', *Journal of Range Management*, vol. 21, pp. 106-108, viewed 26 Apr 2006, <http://jrm.library.arizona.edu/data/1968/212/12mcbr.pdf>
- MacDonald, N.W., Koetje, M.T. and Perry, B.J. 2003, 'Native warm-season grass establishment on spotted knapweed-infested gravel mine spoils', *Journal of Soil and Water Conservation*, vol. 58, no. 5, pp 243-251, viewed 02 Dec 2005, ProQuest Database.
- Mackey, A.P. & Swarbrick, J.T. 1998, *Cabomba caroliniana* A. Gray In F.D. Panetta, R.H. Groves & R.C.H. Shepherd, eds, *The biology of Australian weeds*, vol.2, R.G. & F.J. Richardson, Melbourne.
- McMullen, M.P. & Stack, R.W. 1999, *Fusarium head blight (Scab) of small grains*, North Dakota State University Extension Service, NDSU, viewed: 14 Nov 2005, <http://www.ext.nodak.edu/extpubs/plantsci/smgrains/pp804w.htm>
- Maia FC, Medeiros RB, Pillar VP, Focht T 2004, 'Soil seed bank variation patterns according to environmental factors in a natural grassland,' *Revista Brasileira de Sementes*, vol. 26(2), p.126-137.
- Malo, J., 2004, Potential ballistic dispersal of *Cytisus scoparius* (Fabaceae) seeds, *Australian Journal of Botany*, Vol: 52, No: 5, pp 653–658
- Marchant, N.G., Wheeler, J.R., Rye, B.L., Bennett, E.H., Lander, N.S. and Macfarlane, T.D. 1987, *Flora of the Perth region, Part two*, Western Australian Herbarium, Department of Agriculture, Perth.
- Marloth, R. 1932, *The Flora of South Africa*, vol. 3, Darter Bros & co., Capetown.
- Morishita, D.W. 1991, Biology of jointed goatgrass, National Jointed Goatgrass Research Program, viewed 04 Oct 2005, <http://www.jointedgoatgrass.org/Publications/Abstracts/Pages/JGG/1991/JGGBiology.htm>
- Michelmores, M. 1990, *Biology and control of African Rue*, Peganum Harmala, South Australian Animal and Plant Control Commission, Port Augusta.
- Miller, C. and Skaradek, W. 2002, '*Eastern Baccharis*: *Baccharis halimifolia* L.', United States Department of Agriculture, National Resources Conservation Service, Plant Fact Sheet, viewed 27 Apr 2006, http://plants.nrcs.usda.gov/factsheet/pdf/fs_baha.pdf
- Missouri Botanical Garden (MBG) 2005, *Carex buehneri*, Kemper Centre for Home gardening, Missouri Botanical Gardens, viewed 21 June 2006, <http://www.mobot.org/gardeninghelp/plantfinder/Plant.asp?Code=J630>
- Morera B, 1943 'Some biological data on *Taragom repanda*' Bol. Pat. veg. Ent. agric. Vol. 11 pp 346-349

- Monterey County Agriculture (MCA) 2006 *County of Monterey*, USA, viewed: 25/01/2006, www.co.monterey.ca.us/ag/nox_weeds.htm.
- Moore, L.B. and Edgar, E., 1976, *Flora of New Zealand: volume II: Indigenous Tracheophyta*, A.R. Shearer. Government Printer, Wellington.
- Moran VC & Zimmermann HG 1991, 'Biological control of cactus weeds of minor importance in South Africa,' *Agriculture, Ecosystems and Environment*, vol. 37, p 37-55.
- Morgan, S. 2006, *Ornithogalum*, *Horticulture Week*, Feb 2, 2006, pp. 16-17, viewed 13 June 2006, Proquest database.
- Muyt, A. 2001, *Bush invaders of south east Australia*, RG & FJ Richardson, Melbourne.
- Nasir, E. & S.I. Ali, eds, 1970, *Flora of West Pakistan*.
- Neill DA 1999, Vegetation, p. 13-25, In: P.M. Jørgensen & S. León-Yáñez (eds.). *Catalogue of the vascular plants of Ecuador*. Monogr. Syst. Bot. Missouri Bot. Gard. 75.
- New Zealand Ecological Restoration Network (NZERN) 2005, *Anemanthele lessoniana: hunangamoho bamboo grass; wind grass*, New Zealand Ecological Restoration Network, viewed 06 October 2005, <http://www.members.bush.org.nz/planterguide/fact.cfm?species=Anemanthele%20lessoniana>
- New Zealand Ecological Restoration Network (NZERN), 2006, *Carex buehneri: purei cutty grass*, viewed 15 June 2006, <http://www.members.bush.org.nz/>
- New Zealand Plant Conservation Network (NZPCN) 2005, *Threatened plants: Anemanthele lessoniana*, New Zealand Plant Conservation Network, viewed 06 Oct 2005, http://www.nzpcn.org.nz/nz_threatenedplants/detail.asp?PlantID=225
- Nesom, G. 2001, *Groundsel tree: Baccharis halimifolia L.*, USDA NCRS Plant Guide, Natura; Resources Conservation Service, Louisiana, viewed 24 Apr 2006, http://plants.nrcs.usda.gov/plantguide/doc/pg_baha.doc
- Notten, A. 2001, *Wachendorfia thyrsiflora* Burm. PlantSAfrica.com, SA National Biodiversity Institute, viewed: 14/06/2006, www.planzafrica.com/plantwxys/wachendorfia
- Ogle, C.C., La Cock, G.D., Arnold, G. and Mickleson, N. 2000, 'Impact of an exotic vine *Clematis vitalba* (F. Ranunculaceae) and of control measures on plant biodiversity in indigenous forest, Taihape, New Zealand', *Austral Ecology*, vol. 25, pp. 539-551.
- Ontario Ministry of Agriculture and Food (OMAF) 2005, *Spurge, cypress*, Ontario Vegetation Management Association, viewed 22 Nov 2005, <http://www.ovma.on.ca/Weeds/spurge.htm>
- Opitz, S. 2002, Phenylphenalenones and related phenolic pigments of the Haemodoraceae: Structure, biosynthesis and accumulation patterns in *Xiphidium caeruleum* and *Wachendorfia thyrsiflora*, Dissertation Online, viewed: 14?06/2006, deposit.ddb.de/cgi-bin/dokserv?idn=96722814x&dok_var=d1&dok_ext=pdf&filename=96722814x.pdf
- Osborne, B., Doris, F., Cullen, A., McDonald, R., Campbell, G. and Steer, M. 1991, 'Gunnera tinctoria: an unusual nitrogen-fixing invader', *BioScience*, vol. 41, no. 4, pp. 224-234.
- Pacific Island Ecosystems at Risk 2001, *Risk Assessment: Gymnocoronis spilanthoides*, United States Forestry Service, viewed 06 Feb 2006, <http://www.hear.org/pier/wra/australia/gyspi-wra.htm>
- Pacific Island Ecosystems at Risk, 2005, *Hypericum canariense* risk assessment, Pacific Island Ecosystems at Risk, Hawaiian Ecosystems at Risk Project, viewed 10 Jan 2006, http://www.hear.org/pier/wra/pacific/hypericum_canariense_htmlwra.htm

- Pacific Islands Ecosystems at Risk (PIER) 2005, *Senecio madagascariensis*, Hawaiian Ecosystems at Risk Project, viewed 23 Nov 2005, http://www.hear.org/pier/species/senecio_madagascariensis.htm
- Page, S., and Olds, M. (eds), 1998, *Botanica* 2nd ed, Random House, Milsons Point, NSW, Australia
- Panetta, F.D., Groves R.H. & Shepherd, R.C.H. (eds) 1998, *The biology of Australian weeds: Volume 2*, R.G. & F. J. Richardson, Melbourne.
- Pavek, D 1992 *Toxicodendron radicans*. In: Fire Effects Information System, U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. <http://www.fs.fed.us/database/feis> 15 June 2006
- Perrin N 2003, Cactus & Succulent Society of New Zealand- Wellington-Hutt Valley Branch, MSN Groups, USA viewed: 06/01/2006, <http://groups.msn.com/CactussucculentsocietyofNewZealandandWellingtonhuttV/latesthorokaka.msnw>.
- Perez-Fernandez, M.A., and Lamont, B.B., 2002, Competition between Australian and Spanish legumes growing in seven Australian soils, Plant Conservation Alliance 2005, *Saltcedar*, Alien Plant Working Group, Washington, viewed: 28 July 2005, <http://www.nps.gov/plants/alien/fact/tama1.htm>
- Plants for a Future (PFAF) 2000, *Ornithogalum umbellatum*, Plants for a future database, viewed 13 Jun 2006, (Wallwork *et al* 1992). <http://www.pfaf.org/database/plants.php?Ornithogalum+umbellatum>
- Pnueli L, Hallak-Herr E, Rozenberg M, Cohen M, Goloubinoff P, Kaplan A & Mittler R 2002, 'Molecular and biochemical mechanisms associated with dormancy and drought tolerance in the desert legume *Retama raetam*,' *The Plant Journal* Vol. 31(3), p. 319-330.
- Popov, K.P. 1992, 'Life forms of harmel (*Peganum harmala*)', *Problems of Desert Development*, vol. 5, pp. 75-77, CAB Abstracts.
- Radford, I.J. and Cousens, R.D. 2000, 'Invasiveness and comparative life-history traits of exotic and indigenous *Senecio* species in Australia', *Oecologia*, vol. 125, pp. 531-542.
- Radford, L.J., King, D. and Cousens, R.D. 1995, 'A survey of *Senecio madagascariensis* Poir. (fireweed) density in pastures of coastal New South Wales', *Plant Protection Quarterly*, vol. 10, no. 3. pp. 107-111.
- Randall, R. 2002, 'Weed potential of Canary Islands St. John's wort, *Hypericum canariense* L. (Clusiaceae)', *Weed Science*,
- Reebs, S. 2002, 'Double agent', *Natural History*, vol. 111, no. 4, p. 16, viewed 02 Dec 2005, ProQuest database.
- Regalis Environmental Services (RES) 2002, BOTANICAL SENSITIVITY ANALYSES OF THE LAKES ECO & GOLF ESTATE, Oudtshoorn, Zambia.
- Richter, H. E. 1965, 'Modification of the quality of milk by native plants. 2. Changes in flavour, aroma and colour', *Wien. Tierarztl. Monatsschr.*, vol. 52, pp. 635-644, CAB abstracts.
- Rio Blanco Weed Department (RBWD) 2005, *Rio Blanco County Government*, USA, viewed: 26/01/2006, www.co.rio-blanco.co.us/weedcontrol.
- Rodriguez-Riaño, T., Ortega-Olivencia, A. and Devesa, J.A., 2004, Reproductive biology in *Cytisus multiflorus* (Fabaceae), *Annales Botanici Fennici*, Vol: 4, pp 179–188
- Rogers, G.M. 1989, 'The nature of the lower North Island floristic gap', *New Zealand Journal of Botany*, vol. 27, pp. 221-241.
- Rogers, G.M. & Leathwick, J.R., 1996, 'North Island seral tussock grasslands. 3. The influence of heather (*Calluna vulgaris*) on rates of change from tussock grassland to shrubland', *New Zealand Journal of Botany*, vol. 34, pp. 473-487, viewed 30 Nov 2005, <http://www.rsnz.org/publish/nzjb/1996/161.php>

- Roy, B., Popay, I., Champion, P., James, T. and Rahman, A. 2004, *An illustrated guide to the common weeds of New Zealand*, 2nd ed., New Zealand Plant Protection Society, Hastings.
- Sala O, Deregibus VA, Schlichter T & Alippe H 1981, 'Productivity Dynamics of a Native Temperate Grassland in Argentina,' *Journal of Range Management* 34(1), p. 48-51.
- Sawyer, J.W.D. 2004, *Plant conservation strategy, Wellington Conservancy (Excluding Chatham Islands) 2004-2010*, Department of Conservation, New Zealand.
- Schmidt, R.J. 2005, *Ranunculaceae (Buttercup family)*, Botanical Dermatology Database, viewed 29 Mar 2006, <http://bodd.cf.ac.uk/BotDermFolder/BotDermR/RANU.html>
- Schumann, K. Kirsten, G. & Oliver, E.G.H. 1992, *Ericas of South Africa*, Fernwood Press, Vlaeberg. Schutz, W. 2000, 'Ecology of seed dormancy and germination in sedges (*Carex*)' *Perspectives in Plant Ecology, Evolution and Systematics*, vol. 3, no. 1, pp. 67-89.
- Sheley, R.L., Jacobs, J.S. and Carpinelli, M.F. 1998, 'Distribution, biology, and management of diffuse knapweed (*Centaurea diffusa*) and spotted knapweed (*Centaurea maculosa*)', *Weed Technology*, vol. 12, pp. 353-362.
- Shiraishi, S., Watanabe, I., Kuno, K., and Fujii, Y. 2002, 'Allelopathic activity of leaching from dry leaves and exudate from roots of ground cover plants assayed on agar', *Weed Biology and Management*, vol. 2, pp. 133-142.
- Sindel, B.M., Radford, I.J., Holtkamp, R.H. and Michael, P.W. 1998, 'The biology of Australian weeds. 33. *Senecio madagascariensis* Poir.', *Plant Protection Quarterly*, vol. 13, no. 1 pp. 2-15.
- Solh, M.B. & Pala, M. 1990, 'Weed control in chickpea', *Options Mediterraneennes, Serie Seminaires*, Vol. 9, pp. 93-99, viewed 20 Jan 2006, CIHEAM database.
- South African National Biodiversity Institute (Sanbi) 2006, Kirstenbosch Seed Catalogue, Capetwon, viewed:28/06/2006, www.sanbi.org/products/SeedCat06_3_Eroca_Herbaceous_Pelargoniums.pdf
- Stahevitch, A.E., Crompton, C.W. and Wojtas, W.A. 1988, 'The biology of Canadian weeds. 85. *Euphorbia cyparissias* L.', *Canadian Journal of Plant Science*, vol. 68, no. 1, pp. 175-191.
- Starr, F., Starr, K. & Loope, L. 2003, *Hypericum canariense*: Canary Islands St Johnswort, Clusiaceae, Plants of Hawaii, Hawaiian Ecosystems at Risk Project, viewed 11 Jan 2006, http://www.hear.org/starr/hiplants/reports/html/hypericum_canariense.htm
- Stirton, C.H. 1978, *Plant invaders: beautiful but dangerous*, The Department of Nature and Environmental Conservation of the Cape Provincial Administration, Cape Town.
- Stuart, S. 2005, *This week at the garden: Anemanthele lessoniana*, City of Dunedin, viewed 06 Oct 2005, http://www.cityofdunedin.com/city/?MlvalObj=bg_pow_20050326&MltypeObj=application/pdf&ext=.pdf
- Taranaki Regional Council (TRC) n.d., Chilean rhubarb (*Gunnera tinctoria*), Taranaki Regional Council, Pest Plant Management Programme, viewed 13 Oct 2005, http://www.trc.govt.nz/PDFS/info_pestp/03_chilean_rhubarb.pdf
- Tesky, J. 1992. *Tamarix aphylla*. United States Forest Service, Fire Effects Information System. Available: <http://www.fs.fed.us/database/feis/plants/tree/tamaph/all.html> Last accessed 09/07/03

- The Nature Conservancy 2005, *Element stewardship abstract for Centaurea maculosa*, The Global Invasive Species Initiative, The Nature Conservancy, viewed 02 Dec 2005, <http://tncweeds.ucdavis.edu/esadocs/documnts/centmac.html>
- Thalen, D.C.P. 1979, *Ecology and utilisation of desert shrub rangelands in Iraq*, Dr W Junk Publishers, The Hague.
- Tiley, G.E.D., Dodd, F.S., and Wade, P.M. 1996, 'Biological flora of the British Isles: *Heracleum mantegazzianum*', *Journal of Ecology*, vol. 84, pp. 297-319.
- Townsend, C.C. and Guest, E. (eds) 1980, *Flora of Iraq*, vol. 4, Ministry of Agriculture and Agrarian Reform, Republic of Iraq.
- Turner, D. & Conran, J.G. 2004, 'The reproductive ecology of two naturalised *Erica* species (Ericaceae) in the Adelaide Hills: the rise and fall of two 'would-be' weeds?' *Transactions of the Royal Society of South Australia Incorporated*. Royal Society of South Australia Inc., Vol. 128(1), p. 23-31.
- Tutin, TG (ed) 1980, *Flora Europaea*, University Press, Cambridge.
- Underhill, T.L. 1971, *Heaths and Heathers*, David & Charles, Newton Abbot, GB.
- United States Army Corps of Engineers (USACE) 2002, *Baccharis spp. Britt.* (Baccharis), Engineer Research and Development Centre, Environmental Laboratory, viewed 20 Apr 2006, <http://el.erd.c.usace.army.mil/pmis/plants/html/bacchari.html>
- United States Forestry Service 2004, *Species information: Centaurea maculosa*, United States Department of Agriculture, Forestry Service, viewed 02 Dec 2005, <http://www.fs.fed.us/database/feis/plants/forb/cenmac/all.html>
- United States Geological Survey (USGS) 2005, *Euphorbia cyparissias*, Southwest Exotic Plant Information Clearinghouse, United States Geological Survey, viewed 22 Nov 2005, <http://www.usgs.nau.edu/swepic/>
- University of Massachusetts Online http://gallery.cs.umb.edu/gallery/NFSPlants/BCPdrom0039?set_fullOnly=on. Accessed 19 June 2006
- US Department of Agriculture Forest Service 2004, *Species: Calluna vulgaris*, Forest Service, United States Department of Agriculture, viewed 30 Nov 2005, <http://www.fs.fed.us/database/feis/plants/shrub/calvul/all.html>
- Underhill, T.L. 1971, *Heaths and heathers: Calluna, Daboecia and Erica*, David and Charles Limited, Devon.
- Veldkamp, J.F. 1985, '*Anemanthele* Veldk. (Gramineae: Stipeae), a new genus from New Zealand', *Acta Botanica Neerlandica*, vol. 34, no. 1, pp. 105-109.
- Walgett Shire Council (WSC) 2004, *Supplementary State of the Environment Report for year 2003 – 2004*, Walgett Shire Council, viewed 05 Apr 2006, http://www.walgettshire.com/WalgettShire/our_environment.html
- Wallwork, H., Preece, P. and Cotterill, P.J. 1992, '*Puccinia hordei* on barley and *Ornithogalum umbellatum* in South Australia', *Australasian Plant Pathology*, vol. 21, no. 3, pp. 95-97.
- Walsh, N.G. & Entwistle, T.J. (eds) 1999, *Flora of Victoria: dicotyledons, cornaceae to asteraceae*, vol. 4, Inkata Press, Melbourne.
- Washington State Department of Ecology 2004, *Non-native freshwater plants: salt cedar*, Access Washington, Washington, viewed: 28 July 2005, <http://www.ecy.wa.gov/programs/wq/plants/weeds/aqua013.html>
- Webb, C.J., Sykes, W.R., Garnock-Jones, P.J., 1988, *Flora of New Zealand*, Vol 4, Botany Division, Department of Scientific & Industrial Research, New Zealand
- Weber, E. 2003, *Invasive plant species of the world: a reference guide to environmental weeds*, CABI Publishing, Wallingford.

Weeds CRC, 2003, Alert list for environmental weeds, weed management guide: white Spanish broom (*Cytisus multiflorus*), CRC for Australian Weed Management

Wet Tropics management Authority 2002, *Rainforest Aboriginal heritage*, World Heritage: Wet Tropics, Environment Protection Authority, Cairns, viewed 11 Nov 2005, http://www.wettropics.gov.au/rah/rah_default.html

Weiss, J. Project Leader, Pest Plant Impact Assessment. DPI, Frankston. Tel 9785 0111. (11/07/03)

Whiting, D. 2001, *Detailed information on abrojo, clavellina, coyonoxtle, sheathed cholla*, tencholate (*Cylindropuntia tunicata*), Dave's Garden, viewed 10 Dec 2005, <http://davesgarden.com/pf/go/67945/index.html>

Whiting D 2006 *Detailed information on White Weeping Broom, Portugese Broom (Retama raetam)*, Dave's Garden, Bryan/College Station, Texas, USA, viewed: 02/01/2006, <http://davesgarden.com/pf/go/72774/index.html>.

Williams, P.A., Ogle, C.C., Timmins, S.M., LaCock, G.D., and Clarkson, J. 2005, 'Chilean rhubarb (*Gunnera tinctoria*): biology, ecology and conservation impacts in New Zealand', *DOC Research and Development Series 210*, Department of Conservation, Wellington

WWF Australia. 2003. Weeds and Pests: eradicating the invasive threat. Position Paper 03/01. WWF Australia: Sydney

Yurchenko, V. Y. and Al'muratova, D.N. 1987, '*Peganum harmala* L. – poisonous weed on the pastures of Kazakhstan', *Problems of Desert Development*, vol. 4. Pp. 76-78, CAB Abstracts.

Zohary, M. 1972, *Flora Palestina*, Part II, Israel Academy of Sciences and Humanities, Jerusalem.