

NATIONAL WEEDS PROGRAM

**POTENTIAL ENVIRONMENTAL WEEDS
IN AUSTRALIA**

**CANDIDATE SPECIES FOR
PREVENTATIVE CONTROL**

By S. Csurhes and R. Edwards



POTENTIAL ENVIRONMENTAL WEEDS IN AUSTRALIA by
S. Csurches and R. Edwards
Queensland Department of Natural Resources
Land Protection, Locked Bag 40, Coorparoo Delivery Centre Qld 4151

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Biodiversity Group, Environment Australia (formerly Australian Nature Conservation Agency)

GPO Box 636

Canberra ACT 2601

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PREFACE

Non-indigenous invasive plants are an insidious, widespread and poorly recognised threat to Australia's native plant communities and associated wildlife. To date, at least 2,200 species of non-native plants have naturalised in Australia. Some of these species have invaded native vegetation and replaced native plants. Since additional plant species are imported each year, the invasion process is by no means complete.

Over the years, many opportunities to eradicate vulnerable, localised populations of "potential weeds" have been missed. Some species that could have been eliminated quite cheaply when first detected have now spread over many thousands of hectares. We should learn from past mistakes and ensure that opportunities for preventative control are taken wherever possible. A prerequisite to successful preventative control is the delineation of target species for which eradication may be feasible.

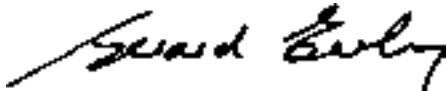
This project highlights a number of opportunities for early preventative control that may be taken to protect native ecosystems against further damage by non-indigenous plants.

FOREWORD

Can weeds be eradicated from Australia? In most cases this is an impossible dream. Controlling environmental weeds is usually an expensive time consuming process and often results in management, not eradication. Occasionally, however, opportunities arise where eradication is possible. These opportunities occur in situations where a weed species is very localised and has not yet begun to spread. Catching a weed before it becomes widespread and well established is perhaps the only chance we have of eradicating some species from Australia.

Unfortunately, a lot of these opportunities have been missed in the past. Weeds that could have been eradicated when first detected are now widespread and require continual resources to contain within given areas. There is also the added complication that not all weed introductions have an effect on the environment. Some weed species remain restricted to the location of their release and never spread beyond that. It is critical to identify weeds that have the potential to become problems and, where feasible, to deal with these swiftly while it is still cost-effective and offers the opportunity for complete control.

This report identifies potential weeds in Australia, prioritising those that have histories as weeds overseas. Prioritisation was based on their known distribution in Australia and on the feasibility of eradication. I believe this report will be a very useful resource to those agencies and organisations who are interested in taking a proactive role in the management of environmental weeds. Opportunities such as the ones highlighted in this report do not present themselves often - we should make the most of them!



**Gerard Early Acting
Head Biodiversity
Group**

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1.0 INTRODUCTION

The aim of this project is to list and describe non-indigenous terrestrial and aquatic plant species considered to have the following attributes:

- represent a threat to native terrestrial or aquatic plant communities
- a localised distribution
- vulnerable to eradication (including species that only exist as cultivated specimens).

Pest management and conservation agencies can use the information contained herein to consider eradication, or at least containment, of potentially invasive plant species. Hopefully, this project will facilitate a reduction in the rate at which additional environmental weed species become established in Australia's bushland and waterways.

2.0 REVIEW OF LITERATURE

2.1 Definition of an "environmental weed"

Humphries *et al.* (1991) chose to define environmental weeds as "*those species that invade native communities or ecosystems - they are undesirable from an ecological perspective, but not necessarily an economic one. Serious environmental weeds are defined as those that cause major modification to species richness, abundance or ecosystem function. Very serious environmental weeds are those that can totally and permanently destroy an ecosystem.*" The authors pointed out that different categories of environmental weeds could not yet be quantitatively defined. In most literature on environmental weeds, the term "serious environmental weed" is usually assigned to widespread species that have an obvious visual impact on native vegetation ie. appear to dominate native species. As such, authors tend to make qualitative assessments of impact based on visual observations. The time scale of weed problems is problematic as species initially considered to be "minor" weeds can become major problems in the long-term.

Environmental weeds have also been defined as "*plant species that have established self-propagating populations in native vegetation, terrestrial or aquatic, outside their natural range.*" (Csurhes 1995). This definition makes provision for Australian native plant species that have become established in areas outside their "natural" range (eg. species native to the eastern States that have naturalised in Western Australia). The definition is broad however, and includes species that may be restricted to highly disturbed habitats such as roadside vegetation or urban bushland remnants where nutrient input is high or where fire has been excluded. As such, some plants covered by this definition may not necessarily represent a significant threat to native plant communities subject to relatively low levels of exogenous disturbance (eg. in large National Parks and conservation reserves).

Swarbrick and Skarratt (1994) defined environmental weeds as "*those plants which invade, persist and proliferate within, and cause maintenance, management, aesthetic or other problems in areas which are either set aside for or managed to protect their native vegetation, fauna or other natural or semi-natural environmental values.*" Perhaps the only criticism is that this definition focuses on conservation areas without acknowledging the capacity for invasive plants to damage native vegetation on land used for other purposes. In the literature, the term

'environmental weed' tends to be synonymous with several other terms including 'invasive plants', 'alien plants', 'weeds of conservation reserves', 'bushland weeds', 'exotic weeds' and 'non-indigenous, naturalised plants'.

2.2 Impacts of environmental weeds

2.2.1 Impacts on ecosystem function

Some impacts on ecosystem function include: a)

Competition for resources

Environmental weeds can compete with locally indigenous plant species for resources (including sunlight, moisture and nutrients). Many of Australia's major environmental weed species were imported without their natural pests/diseases and do not suffer significant damage from Australian insects, fungi or other organisms. For example, one of Australia's worst environmental weeds, the Indian blue thunbergia vine (*Thunbergia grandiflora*), does not appear to suffer any insect or pathogen damage when growing in north Queensland rainforest. Its growth is not kept in check and can be extremely vigorous, enabling the vine to outcompete slower growing native plants for sunlight. As such, freedom from a range of "co-evolved predators and parasites" may provide imported environmental weeds with a competitive advantage over certain native plants.

b) Prevention of recruitment

Growth of environmental weeds can be sufficiently vigorous to reduce or prevent the establishment of native plant species. For example, in southwest Ireland, the introduced *Rhododendron ponticum* is believed to inhibit regeneration of native woodland plants by creating a dense shade and by producing an impenetrable litter layer (Usher 1987). Similarly, in dry sclerophyll forests east of Melbourne, the cover and abundance of indigenous plant species was found to decline in response to increasing cover and abundance of invading *Pittosporum undulatum* (Mullet and Simmons 1995). The latter authors found that dense growth of *P. undulatum* produced heavy shade which resulted in a 90% decline in native plant species, in some cases resulting in the complete loss of the forest understorey,

c) Alteration of geomorphological processes

Invasion and subsequent prolific growth of the introduced grass, *Ammophila arenaria*, is believed to have resulted in changes to the topography of sand dunes in North America (Barbour and Johnson 1977). Similar alterations to dune configuration have been reported in South Africa and Australia (Macdonald and Richardson 1986).

d) Alteration of hydrological cycles

Invasion of watercourses by *Tamarix spp.* in North America is believed to have resulted in a lowering of water tables (Vitousek 1986). *Tamarix spp.* are phreatophytes (rooted in ground water) and do not actively regulate their transpiration; as a consequence they can desiccate watercourses and marshes (Neill 1983). Although not formally documented, a similar process is likely to be occurring in central Australian watercourses currently being invaded by *Tamarix spp.*

e) Alteration of nutrient content of soil

In Hawaii, invasion by the shrub *Myrica faya* is believed to have increased soil nitrogen content. *M faya* has a symbiotic relationship with *Frankia*, a root fungus with the capacity to fix atmospheric nitrogen. Increased soil nitrogen levels could favour invasion by other non-indigenous plant species, such as *Psidium cattleianum* (Vitousek and Walker 1989).

e) Alteration of fire regime

Invasion by *Andropogon sp.* and other introduced grasses has increased the fuel load and intensity of fires in Hawaii Volcanoes National Park (Smith 1985). In South African fynbos reserves, invasive shrubs are believed to have decreased the frequency and mean intensity of fire (Van Wilgen and Richardson 1985). Altered fire regimes may lead to significant changes to the composition of native plant communities, including changes to abundance of certain species within the community. Some species within a community can be favoured by a modified fire pattern, whereas others may suffer recruitment failure or may be killed by fire.

f) Changes to abundance of indigenous fauna

Modifications to native plant communities caused by environmental weeds can result in modification to the population sizes of associated wildlife species. In cases where indigenous fauna rely on native plants for food, breeding sites and shelter from predators, invasion by environmental weeds can result in loss of fauna. For example, in coastal areas of northern Australia, the abundance of certain native bird and lizard species was found to be significantly lower on sites invaded by *Mimosa pigra* when compared to sites free of the weed (Braithwaite *et al.* 1989). In the short term, however, environmental weed invasions can favour certain species of fauna, particularly in cases where animal species have managed to adapt to a new and perhaps more plentiful food supply provided by an invading plant. For example, the study by Braithwaite *et al.*, mentioned above, found that populations of certain small mammal and bird species increased in areas invaded by *Mimosa pigra*. The authors pointed out, however, that increases in fauna populations may be temporary, since the survival of the fauna in question relied on access to native vegetation which surrounded the expanding stands of *M. pigra*.

The list of impacts discussed above is by no means exhaustive and further research is expected to reveal additional perturbations in ecosystem function.

2.2.2 Spatial and temporal nature of impacts

The impacts of environmental weeds can vary spatially and temporally. Depending on the attributes of the invasive species and the characteristics of the habitat being invaded, environmental weeds may:

- colonise highly disturbed areas within remnant areas of bushland or wetlands (including the edges of remnants)
- colonise gaps' created in existing vegetation cover
- become integrated within native plant communities, perhaps replacing a number of native species
- dominate plant communities to the exclusion of most locally native plants, perhaps leading to reductions in dependant populations of certain wildlife species.

Whether or not a particular species will dominate a substantial proportion of available niches over time and persist as an integrated component of a plant community will vary considerably between species. For example, some species such as *Solanum mauritianum* (wild tobacco tree) and *Ageratum houstonianum* (blue billy goat weed) are short-term colonisers of

gaps. Both species are readily outcompeted by taller native shrubs and trees. By comparison other weeds, such as *Lantana camara* and *Chrysanthemoides monilifera* ssp. *rotundata* (bitou bush), can colonise specific habitats and persist at a site for more than 50 years with little sign of successional progression.

Plant species that dominate the early successional stages of plant communities are sometimes referred to as 'r selected' or 'R (ruderal) species' (as opposed to the 'k selected'), 'C' (competitive) and 'S (stress-tolerant) species' (MacArthur and Wilson, 1967; Grime, 1977, 1979, 1985). Typically, these species possess attributes that enable them to rapidly colonise gaps created in the original vegetation cover. Such attributes include:

- rapid growth
- high fecundity
- very effective dispersal vectors (highly mobile propagules).

Plant species that colonise disturbed areas tend to be described as "aggressive" by casual observers, simply because the plants have occupied open spaces in relatively short periods of time. Within a few years, however, the plants are usually replaced by larger native shrubs and trees as the succession progresses. It may be argued that the most serious environmental weed species are likely to be 'k selected' or 'stress tolerant' species that can invade mature plant communities, compete with mature native plants and persist indefinitely.

Reasons for spatial variation in the impacts of environmental weeds are difficult to explain, but may be attributed to the structure and disturbance history of the community being invaded. Some hypotheses on what makes natural communities susceptible to invasion have been discussed by Fox and Fox (1986). Although there is some evidence to suggest certain community types may be more susceptible to invasion (Aplin *et al.* 1983a, b and Abbott 1980 in Fox and Fox 1986), the processes that predispose a community to invasion are poorly understood. Perhaps the only generalisation that can be made is that disturbance favours invasion, but is not necessarily essential for invasion to occur.

Australian plant communities are subject to an on-going, dynamic disturbance regime, both endogenous and exogenous, and few, if any, communities have been spared from the impacts of European man. As such, a broad 'spectrum' of disturbance regimes exists in Australia, ranging from intense, frequent and extensive disturbance regimes to mild, sporadic and localised disturbances. Depending on the features of the disturbance regime in operation at a particular site, the floristic composition and structure of plant communities that exist at that site will be influenced accordingly; as will the extent of invasion by non-native plants.

2.3 Number of environmental weed species in Australia

Since European settlement, non-native plant species have naturalised in Australia at an average rate of at least 11 species per annum. Hnatiuk (1990) listed some 2,200 species of naturalised plants in Australia. At least 1,226 species have naturalised in Queensland (P. Robins, *pers. comm.*). Similarly, Western Australia has recorded some 1,032 naturalised species (Keighery 1995), 980 species in New South Wales (Humphries *et al.* 1991), 825 species in Victoria (Forbes *et al.* 1984), at least 532 species in the ACT (Berry and Mulvaney 1995), 904 species in South Australia (Kloot 1987), 700 species in Tasmania (Humphries *et al.* 1991) and 201 species in the Northern Territory (Chippendale 1972).

Not all naturalised plant species should be considered as 'environmental weeds', however, as some do not invade native vegetation (some remain restricted to abandoned farmland and

roadsides etc). Humphries *et al.* (1991) suggested that about half the naturalised plant species in Australia invade native vegetation and probably a quarter are serious or very serious environmental weeds, or have the potential to be so. Of the 1,032 naturalised plant species recorded in Western Australia, 558 species are present in bushland (Keighery 1995). Similarly, of the 825 naturalised species in Victoria, 576 species have been listed as environmental weeds (Carr *et al.* 1992).

Perhaps the most up-to-date list of environmental weeds in Australia is a list of 1,059 species prepared by Swarbrick and Skarratt (1994). Provided existing policies and legislation on plant importation and sale remain in place, the number of environmental weed species in Australia will continue to increase.

2.4 Source of environmental weeds

Non-indigenous plant species are imported from around the world via a number of avenues, both accidental and deliberate. Not all the plants imported each year become weeds. Groves (1986) suggested that perhaps only 5% of imported plant species become naturalised and only 1-2% of all introductions become weeds.

2.4.1 Accidental introductions

International trade and travel facilitates the accidental introduction of additional plant species. Seeds of new environmental weed species can be accidentally introduced via the following avenues:

- as contaminants of imported pasture seed or grain
- adhering to imported machinery or goods
- adhering to the clothes of travellers.

In 1992-93, some \$49 billion worth of imports, including 644,000 freight containers and some 5.3 million passengers on 2,600 international flights landed in Australia (DPIE, 1993). The potential for importation of weed seeds adhering to freight and travellers is significant and the task of quarantine inspection onerous.

2.4.2 Deliberate introductions

The rate of plant species introduction into Australia via legal avenues is difficult to estimate. Although the Australian Quarantine and Inspection Service (AQIS) has relevant information on file, data is not yet readily available. In 1993, at least 274 permits to import live plant material were issued by AQIS, possibly involving some 3,500 taxa (Panetta *et al.* 1994). In addition, larger numbers of plant species are imported as seed. Govaars and Tibbits (1994) reported 1,842 introductions into Australia covering at least 217 taxa (many are only identified to genus) for the Commonwealth Plant Introduction (CPI) numbers for 1993. These figures only include seed introduced for use by research agencies and are in addition to seed introduced by commercial nurseries and private individuals. Panetta *et al.* (1994) suggested that perhaps a total of 5,000 taxa are introduced into Australia each year and that approximately 500 of these are taxa not previously introduced.

Public demand for exotic ornamental plants and agricultural demand for new pasture/fodder species are major driving forces behind the deliberate importation of additional plant species, a proportion of which may have weed potential. At least 30% of Australias established noxious weed species (of which a proportion are environmental weeds) were originally

introduced as garden plants (Panetta 1993). Virtually all of Australia's major water weed species were originally imported for use in garden ponds or as ornamental aquarium plants.

Once a potentially invasive plant species is cultivated widely, in either the nursery trade or the aquarium plant trade, escape into the wild is inevitable. The propagules of non-indigenous garden plants can be dispersed over considerable distances by birds, wind or rainfall runoff. Non-native aquarium plants are being cultivated in public waterways for subsequent sale to retail pet stores. Public demand for hardy, cheap aquarium plants drives the trade in non-native water plants.

In the past, new "improved" species of pasture grasses, legumes and fodder species were imported and planted with inadequate consideration given to their potential impact on native ecosystems. Of 463 non-native pasture plants introduced into northern Australia between 1947 and 1985, only 21 (5%) proved useful to agriculture while 60 (13%) became listed as weeds. Of the 21 useful plants, 17 later became weeds on non-grazing land, leaving only 4 species (less than 1%) that were useful without causing weed problems (Lonsdale 1994).

Despite the efforts of the Federal quarantine service, it is easy for people to smuggle seed of new plant species into the country via the mail system. Some 200 million postal articles are received in Australia per annum (DPIE 1993) and it is not feasible to check the contents of each.

2.5 Preventative weed management - early detection and eradication

In the past, pest management agencies tended to adopt a reactive approach to pest management, allocating most of the available control resources to the containment or biological control of widely naturalised species. The importation of additional weed species and the sale and cultivation of potential weeds was virtually ignored. It could be said that such an approach was analogous to "mopping up the spill while the tap was still running" (Csurhes and Beilby 1994). Today, it is becoming apparent that increased attention should be paid to the "precautionary principle" and a philosophy of "prevention rather than cure", particularly in view of the recommendations presented in the National Weeds Strategy (1996).

Humphries *et al.* (1991) suggested that prevention and early eradication represent the most powerful tools available to weed managers in their efforts to control an expanding number of economically and environmentally damaging foreign plant species in Australia. Similarly, the importance of exclusion, early detection and eradication has been highlighted by Moore (1975), Zamora *et al.* (1989), Panetta (1993), Hobbs (1995) and the National Weeds Strategy (1996).

Populations of invasive species are vulnerable to collapse while in their very early stages of naturalisation. Once firmly established, pest populations usually become very resilient and control costs become enormous. Provided potential pests are detected in their very early stages of establishment, eradication can be successful and inexpensive. For example, the removal of all known specimens of *Acacia karroo* (a species highlighted by Scott (1991) as a potentially serious weed of Australia) from three locations in Western Australia is considered to have cost only a few hundred dollars (J. Dodd, *pers. comm.*). In comparison, costs associated with the control of widespread weeds can be substantial. For example, a largely unsuccessful biological control campaign directed at *Parthenium hysterophorus*, a widespread weed in Queensland, has cost \$3.5M (Cruttwell-McFadyen 1992). The latter cost is in addition to several millions of dollars expended on herbicide application and public awareness campaigns designed to reduce the plant's rate of spread.

For eradication to be feasible and cost-effective, potential pest plants must be detected in their very early stages of establishment, preferably when the entire population numbers less than a few hundred individuals. Eradication campaigns generally fail if one or more of the following criteria are not met:

- the population of the target pest must be highly localised and the boundaries of the population assessed beforehand
- an effective control method needs to be available
- the infested area must not be continually re-infested from surrounding areas or from nearby cultivated specimens
- treated areas need to be monitored for many years so that seedling regrowth is avoided (this requires continuity of funding for the program).

The reproductive attributes of target species need to be assessed before eradication is attempted, otherwise control resources can be wasted in unsuccessful attempts at eradication (eg. eradication of a species that produces wind-dispersed or bird-dispersed seeds is generally less likely than a species that reproduces from rhizomes).

A good example of a failed eradication/containment program is provided by the invasive shrub, *Myrica faya*, in Hawaii Volcanoes National Park. The plant was first discovered in 1961, but was ignored for many years. By 1978, 609 hectares were infested and by 1985, some 12,000 hectares were infested in spite of attempted control by park managers (Whiteaker and Gardner 1986). Macdonald *et al.* (1989) commented that effective control of *M faya* was thwarted by:

- periodic lapses in control effort
- seed sources adjacent to the area targeted for control
- the biology of the plant (an average mature female tree produces more than 400 000 bird-dispersed fruits per year (Whiteaker and Gardner 1987)).

A pre-requisite to the application of early detection and eradication protocols is the delineation of species that may have weed potential. Since there are literally hundreds, if not thousands, of plant species that have pest potential in Australia, candidate species need to be assessed and prioritised. Some species with weed potential already occur in Australia, whereas many more are yet to be imported. Michael (1989) reviewed potential weeds of northern Australia and presented a prioritised list of 23 species (species not recorded in the country). Similarly, Csurhes (1991) prepared a prioritised list of more than 700 potential weed species not yet recorded in Australia.

It may be argued that potential weed species considered to be in their early stages of naturalisation deserve immediate attention. The development of a system for prioritising a long list of candidate species is required and has been attempted in this study.

2.6 Predicting weed potential

It is difficult to predict which plant species will become significant environmental weeds. Forcella *et al.* (1986) and Zamora *et al.* (1989) suggested that an invading plant's weed potential is indicated by the climatic characteristics of its native country, its history of spread in other countries, and its similarities to recognised weeds. Carr *et al.* (1992) suggested that criteria for assessing weed potential should include; proven weediness of related taxa, reproductive potential, dispersability and ability to flourish in a given climate. Taxon may imply noxious potential by association (Forcella 1985), since the families Poaceae and

Asteraceae contain almost 40% of the world's weeds of agriculture (Henry and Scott 1981, Radosevich and Holt 1984). Seed and fruit morphological features that facilitate dispersal have been recognised as important indicators of potential invasiveness (Salisbury 1961, Howe and Smallwood 1982, Carr *et al.* 1992). Generalised indicators of potential weediness have been considered by Hazard (1988) and incorporated into a scoring system designed to quantify the risk posed by the importation of nominated plant species into Australia. Hazard's indicators include: history as a weed elsewhere, related taxa with weed history, association with the families Asteraceae, Amaranthaceae and Brassicaceae, thorns/burrs, capacity for vegetative reproduction (eg, stolons), wind/water and bird dispersal. Panetta (1993) suggested that a weed's history as a pest elsewhere in the world (in similar climatic conditions) may be the most reliable basis for predicting weediness in Australia.

The validity of predictions based on attributes that imply weediness has been questioned by Roughgarden (1986), Crawley (1987) and Noble (1989). Hobbs and Humphries (*in press*) suggest that a successful invasion may depend not only on the characteristics of the invading species but also on the characteristics, dynamics and history of the site being invaded.

The Australian Quarantine and Inspection Service (AQIS) undertakes assessments of potential weediness, among other things, for all new plant species proposed for importation into Australia. Assessments are conducted on all forms of plant material, including seeds and live material of terrestrial and aquatic plants. To assess potential weediness, AQIS applies the screening system developed by Hazard (1988) and a more refined weed risk assessment (WRA) system developed by Pheloung (1995). Formal adoption of the WRA system for all new assessments is expected to occur late in 1997. Both systems consider a species' biological attributes (including reproductive characteristics), its history as a weed elsewhere and its climatic preference. Based on these criteria, a candidate species is assigned a numerical 'score' and is either rejected, assessed in more detail or approved for importation, depending on its score. Free-floating aquatic species and species that have histories as weeds elsewhere and are suited to Australian climates are rejected immediately by the Hazard system. Other species that appear to possess weedy attributes such as multiple modes of reproduction or dispersal are assessed in more detail and may be rejected or approved depending on the outcomes of the assessment. Application of these protocols will reduce the number of potentially weedy species imported.

3.0 METHODOLOGY

3.1 Background considerations

Following a review of the literature, we were unable to establish reliable criteria that could be used to prioritise candidate species based on either biological attributes or potential impact on native plant communities. Since Panetta (1993) commented that perhaps the only reliable indicator of weed potential is a plant's history as a pest elsewhere (in similar climates), a decision was made to prioritise candidate species based on this criterion. This criterion is perhaps the most defensible method for prioritising species and can be used to justify control action. Furthermore, we argue that a species which is well documented as a major weed elsewhere, in a climate similar to our own, should not be ignored. A similar approach has been taken to allocate priority to well known potential exotic diseases of Australia, including foot and mouth disease and rabies.

A decision was made to limit this study to non-indigenous plant species. It is acknowledged, however, that native plant species can cause problems where they have become naturalised outside their "natural" range. For example, *Eucalyptus maculate*, a native of eastern Australia, has invaded native vegetation in Western Australia. Similarly, species native to north Queensland have become naturalised in southern Queensland (eg. *Schefflera actinophylla*). Furthermore, the redistribution or mixing of genetic material within the natural range of a single native species can have detrimental impacts on plant populations. However, this topic is not treated in the current report.

3.2 Prioritisation process

The following process was used to compile a list of potential environmental weeds and to prioritise targets for eradication (process illustrated in Figure 1):

Step 1: Preparation of an initial list of potential environmental weed species.

Approximately 102 people representing pest management agencies, conservation agencies, herbaria and private businesses from around Australia were invited to nominate plant species that:

- a) they consider to be "potential environmental weeds"; and,
- b) appear to be in a very early stage of naturalisation (including species restricted to gardens).

Sixty three responses were received. Species are listed in Table 1.

Step 2: Review and prioritise initial list of species in Table 1.

Species listed in Table 1 were first "screened" by removing species considered to be native to Australia. To achieve this we relied on information provided by one or more State herbaria and the Australian Census of Vascular Plants (Hnatiuk 1990). Species considered to be native to Australia are listed in Appendix A.

The remaining species were again "screened" by removing species that do not have documented histories as weeds overseas. As some of these species may still become serious weeds in Australia, information on each species is presented in Appendix B.

Step 3: Prioritise species that have histories as weeds overseas, based on the feasibility of eradication.

Species that have histories as weeds overseas were prioritised based on their distribution in Australia and the probability of successful eradication. We experienced some difficulty assessing 'feasibility of eradication' since there are many variables to consider. Some factors that influence feasibility of eradication include:

- size of known infestations and probability of additional unknown infestations
- prevalence of the species in the nursery trade
- use of the plant for commercial/agricultural purposes
- practicality of eradication by relevant State/Local Government pest management and conservation agencies (including availability of effective control methods, accessibility of infestations and risk of non-target damage by herbicides)
- availability of sufficient funding and labour
- level of public and agency motivation and 'will' to achieve eradication.

We acknowledge that the level of funding available to pest management agencies will be one of the most important limitations to the number and magnitude of eradication programs.

Candidate species for eradication are listed in Table 2. Species in Table 2 were divided into three categories, based on the probability of successful eradication:

1) High probability of eradication - species that are not yet naturalised and have only been recorded in a small number of gardens (species restricted to botanic gardens, zoos etc and/or species that have not been widely sold in the nursery trade). Eradication is likely to cost less than a thousand dollars.

2) **Moderate probability** of eradication - species that are not yet naturalised but have been cultivated widely for ornamental, agricultural or other purposes. Eradication may be feasible but would require extensive searching and public awareness campaigns to detect plants.

3) **Low probability of** eradication - species that have naturalised but only occur as small, isolated populations. Depending on the size of infestations, eradication may be possible but can be expected to require provision of significant funding (perhaps ranging from tens of thousands to hundreds of thousands of dollars). For some species, eradication programs may be as large as the current siam weed eradication program in north Queensland (viz, c. \$850,000 over 5 years).

Species from Table 1 that have histories as weeds overseas but are considered too widespread to be eradicated are described in Appendix C.

**Post management/conservation agencies
and individuals invited to nominate
potential environmental weeds**

Table 1: List of nominated species

First

- ▶ Native species
- ▶ Species with no histories as weeds outside Australia

**Non-native species with histories as
weeds outside Australia**

Second

- ▶ Species known to be beyond our borders

Table 2: List of eradication targets

Figure 3. Work flow process used to assess the potential environmental weeds and eradicate weeds in 2009.

4.0 RESULTS

4.1 Lists of potential environmental weeds

4.1.1 Table 1.

Initial list of species nominated as "potential environmental weeds" of Australia.

SPECIES	FAMILY NAME	WEED HISTORY OVERSEAS
<i>Acacia boliviana</i>	Mimosaceae	no
<i>Acacia catechu</i> (L. f.) Willd. (Syn. <i>A. polyacantha</i>)	Mimosaceae	yes
<i>Acacia erioloba</i> E. Mey. (Syn. <i>A. giraffae</i> Burch)	Mimosaceae	yes
<i>Acacia karoo</i> Hayne	Mimosaceae	yes
<i>Acacia podalyriifolia</i> G. Don.	Mimosaceae	yes (native)
<i>Acacia saligna</i> (Labill.) H.L.Wendl.	Mimosaceae	yes (native)
<i>Acacia sieberiana</i>	Mimosaceae	yes
<i>Acer negundo</i> L.	Aceraceae	yes
<i>Acer pseudoplatanus</i> L.	Aceraceae	yes
<i>Achillea distans</i> Willd.	Asteraceae	no
<i>Achillea ptarmica</i> L.	Asteraceae	yes
<i>Aegopodium podagraria</i> L.	Apiaceae	yes
<i>Albizia lophantha</i> (Willd.) Benth. (Syn. <i>A. disticha</i> , <i>A. montan</i> <i>Paraserianthes lophantha</i>)	Mimosaceae	yes (native)
<i>Alectryon tomentosus</i> (EMuell) Radlk.	Sapindaceae	no (native)
<i>Alisma lanceolatum</i> With.	Alismataceae	yes
<i>Allamanda cathartica</i> L.	Apocynaceae	no
<i>Alnus glutinosa</i> (L.) Gaertn.	Betulaceae	no
<i>Alnus rubra</i> Bong. (Syn. <i>A. serrulata</i> Willd.)	Betulaceae	yes
<i>Aloe cameroni</i> Hemsley	Aloeaceae	no
<i>Aloe ferox</i> Mill.	Aloeaceae	yes
<i>Alternanthera denticulata</i> R. Br.	Amaranthaceae	yes (native ?)
<i>Alternanthera philoxeroides</i> (Mart.) Griseb.	Amaranthaceae	yes
<i>Anacardium occidentals</i> L.	Anacardiaceae	yes
<i>Andropogon gayanus</i> Kunth.	Poaceae	yes
<i>Annona glabra</i> L.	Annonaceae	yes
<i>Annona squamosa</i> L.	Annonaceae	yes (native ?)
<i>Anredera cordifolia</i> (Tenore) Steenis	Basellaceae	no
<i>Anthoxanthum odoratum</i> L.	Poaceae	yes
<i>Antigonon leptopus</i> Hook. and Arn.	Polygonaceae	yes
<i>Araujia hortorum</i> Fourn. (Syn. <i>Araujia sericifera</i> Brot., <i>Physianthus albens</i> C. Martius)	Asclepiadaceae	yes
<i>Arbutus unedo</i>	Ericaceae	no

SPECIES	FAMILY NAME	WEED HISTORY OVERSEAS
<i>Ardisia crenata</i>	Myrsinaceae	no
<i>Ardisia crispa</i> (Thunb.) DC.	Myrsinaceae	no
<i>Ardisia humilis</i> Vahl.	Myrsinaceae	yes
<i>Aristea ecklonii</i>	Iridaceae	no
<i>Aristolochia elegans</i> Masters (Syn. <i>A. littoralis</i>)	Aristolochiaceae	no
<i>Arrhenatherum elatius</i> (L.) Presl. & C. Presl.	Poaceae	yes
<i>Asparagus africanus</i> Lam. (Syn. <i>Protasparagus africanus</i> (Lam.) Oberm., <i>Asparagus cooper!</i>)	Liliaceae	no
<i>Asparagus densiflorus</i> (Kunth) Jessop (Syn. <i>Protasparagus densiflorus</i> (Kunth) Oberm, <i>PP aethiopicus</i> (L.) Oberm, <i>Asparagus aethiopicus</i> L.A sprengeri Regel.)	Liliaceae	yes
<i>Azadirachta indica</i> A. Juss. (Syn. <i>Melia azadirachta</i> L., <i>Antelaea azadirachta</i> (L.) Adelbert)	Meliaceae	yes
<i>Barleria cristata</i>	Acanthaceae	no
<i>Barleria lupulina</i>	Acanthaceae	no
<i>Barleria prionitis</i> L.	Acanthaceae	yes
<i>Basella alba</i> L.	Basellaceae	no
<i>Bauhinia monandra</i> Kurz	Caesalpiniaceae	no (native)
<i>Berberis darwinii</i> Hook.	Berberidaceae	no
<i>Brillantaisia lamium</i> Benth.	Acanthaceae	yes
<i>Buddleja davidii</i> Franchet	Loganiaceae	yes
<i>Bulbostylis striatella</i> C. B. Clarke	Cyperaceae	no
<i>Calepina irregularis</i> Thell. (Syn. <i>C corvini</i> Desv., <i>Myagrum</i> <i>irregulare</i> Asso.)	Brassicaceae	yes
<i>Calliandra</i> spp.	Mimosaceae	no
<i>Callisia fragrans</i> (Lindley) Woodson	Commelinaceae	no
<i>Callitriche stagnalis</i> Scop.	Callitrichaceae	yes
<i>Calluna vulgaris</i> (L.) Hull	Ericaceae	yes
<i>Calopogonium mucunoides</i> Desv.	Fabaceae	yes
<i>Calotropis gigantea</i> (L.) R. Br.	Asclepiadaceae	yes
<i>Camellia sinensis</i> (L.) Kuntze	Theaceae	no
<i>Cardaria draba</i> (L.) Dew	Brassicaceae	yes
<i>Caryota mitis</i>	Arecaceae	no
<i>Cassia alata</i> L. (Syn. <i>Herpetica alata</i> Rafin., <i>Senna alata</i>)	Caesalpiniaceae	yes
<i>Cassia siamea</i>	Caesalpiniaceae	no
<i>Castilla elastica</i>	Moraceae	no
<i>Catharanthus roseus</i> (L.) G. Don (Syn. <i>Vinca rosea</i> L.)	Apocynaceae	yes
<i>Cedrela odorata</i> L.	Meliaceae	yes
<i>Celtis occidentalis</i> L.	Ulmaceae	yes

SPECIES	FAMILY NAME	WEED HISTORY OVERSEAS
<i>Celtis sinensis</i> Pers.	Ulmaceae	yes
<i>Cestrum elegans</i> (Neumann) Schldl.	Solanaceae	no
<i>Cestrum parqui</i> L'Herit	Solanaceae	yes
<i>Chasmanthe aethiopica</i> (L.) N.E. Brown (Syn. <i>Chasmanthe floribunda</i> (Salisb.) N.E. Br.)	Iridaceae	no
<i>Chromolaena odorata</i> (L.) RM.King and H. Robinson (Syn. <i>Eupatorium odoratum</i> L.)	Asteraceae	yes
<i>Chrysanthemoides monilifera</i> (L.) Norlindh	Asteraceae	yes
<i>Chukrasia velutina</i>	Meliaceae	no
<i>Cinnamomum camphora</i> T Nees & C. Eberm.	Lauraceae	no
<i>Clematis flammula</i>	Ranunculaceae	no
<i>Clematis vitalba</i> L.	Ranunculaceae	yes
<i>Clerodendrum chinense</i> _(Osb.) Mabberley (Syn. <i>C. fragrans</i> (Vent.) Willd., <i>C. fragrans</i> var <i>multiflex</i> (Sweet) Moldenke; <i>C. ilippinum</i> Schauer)	Verbenaceae	yes
<i>Clerodendrum grandiflora</i>	Verbenaceae	no
<i>Clitoria lauri</i> Poiret.	Fabaceae	no
<i>Coccinia grandis</i> (L.) Voigt. (Syn. <i>C. cordifolia</i> (L.) Cogn, <i>Bryonia grandis</i> L.)	Cucurbitaceae	yes
<i>Coffea</i> spp.	Rubiaceae	no
<i>Coprosma repens</i> A.Rich.	Rubiaceae	no
<i>Coreopsis lanceolata</i> L.	Asteraceae	yes
<i>Cortaderia selloana</i> .. (Schultes & j.H..Schultes) Asch. & Graebner	Poaceae	yes
<i>Cotoneaster horizontalis</i>	Rosaceae	no
<i>Crassula multicava</i> Lemaire subsp. Multicava	Crassulaceae	no
<i>Crataegus c galli</i> .	Rosaceae	yes
<i>Crataegus monagyna</i> Jacq.	Rosaceae	yes
<i>Crataegus oxycantha</i> L.	Rosaceae	yes
<i>Crococsmia crocosmiifolia</i> (Nicholson) N.E.Br.	Iridaceae	no
<i>Cryptostegia madagaseariensis</i>	Asclepiadaceae	no
<i>Cupressus lusitanicus</i> Miller	Cupressaceae	no
<i>Cupressus macrocarpa</i> Gord.	Cupressaceae	no
<i>Curculigo eapitulata</i> (Lour.) Kuntze (Syn. <i>Molineria capitulata</i>)	Liliaceae	no (native?)
<i>Cuscuta planiflora</i> Tenore	Cuscutaceae	yes
<i>Cynoglossum creticum</i> Mill.	Boraginaceae	yes
<i>Cyperus vorsteri</i> K.L. Wilson	Cyperaceae	no
<i>Cytisus palmensis</i> (Christ) Hutch. (Syn. <i>Cytisus proliferus</i> (L., f.) Link., <i>Chamaecytisus palmensis</i>)	Fabaceae	no

SPECIES	FAMILY NAME	WEED HISTORY OVERSEAS
<i>Cytisus scoparius</i> L. Link (Syn. <i>Sarothamnus scoparius</i> (L.) Wimm.)	Fabaceae	yes
<i>Dalbergia sisoo</i> Roxb.	Fabaceae	no
<i>Delairea odorata</i> Lam. (Syn. <i>Senecio mikanoides</i> Otto ex Walp)	Asteraceae	yes
<i>Delonix regia</i> (Bojer) Rafin.	Caesalpiniaceae	no
<i>Digitalis purpurea</i> L.	Scrophulariaceae	yes
<i>Digitaria decumbens</i> Stent.(Syn. <i>Digitaria eriantha</i> Steudel subsp. <i>pentzii</i> (Stent) Kok).	Poaceae	yes
<i>Diplachne uninervia</i> (Syn. <i>Leptochloa uninervia</i> (Presi.) Hitchc. and A. Chase, <i>Megastachya uninervia</i> Presl.)	Poaceae	yes
<i>Echinochloa polystachya</i> (Kunth) Hitchc. (Syn. <i>Pseudechinolaena polystachya</i> (H.G.K.) Stapf. <i>Q. lismenus polystachyus</i> Kunth.) <i>Echinodorus cordifolius</i> (L.) Griseb.	Poaceae	yes
<i>Eleocharis parodii</i> Baros	Cyperaceae	no (native ?)
<i>Equisetum arvense</i> L.	Equisetaceae	yes
<i>Equisetum hyemale</i> L.	Equisetaceae	yes
<i>Eragrostis curvular</i> Nees, .	Poaceae	yes
<i>Erica arborea</i> L.	Ericaceae	yes
<i>Erica baccans</i> L. Ericaceae	no	
<i>Erica lusitanica</i> Rud.	Ericaceae	yes
<i>Erica melanthera</i>	Ericaceae	no
<i>Erica quadrangularis</i>	Ericaceae	no
<i>Erigeron karwinskianus</i> DC.	Asteraceae	yes
<i>Eriobotrya japonica</i> (Thunb.) Lindley	Rosaceae	yes
<i>Eryngium maritimum</i> L.	Apiaceae	yes
<i>Erythrina crista galli</i>	Fabaceae	no
<i>Eucalyptus clado</i> R Muell.	Myrtaceae	yes (native)
<i>Eugenia uniflora</i> L.	Myrtaceae	no
<i>Euphorbia maculata</i> L.	Euphorbiaceae	yes
<i>Euphorbia paralias</i> L.	Euphorbiaceae	no (native ?)
<i>Festuca rubra</i> L. Poaceae	yes	
<i>Fuchsia magellanica</i> Lam.	Onagraceae	yes
<i>Gazania regens</i> (L.~ Gaertner	Asteraceae	yes
<i>Genista linifolia</i> L. (Syn. <i>Cytisus linifolius</i> (L.) Lam., <i>Teline linifolia</i> (L.) Webb & Berth.)	Fabaceae	yes
<i>Genista monspessulana</i> (L.) L. Johnson (Syn. <i>Cytisus monspessulana</i> (L.), <i>Teline monspessulana</i> (L.) K. Koch.)	Fabaceae	yes
<i>Glechoma hederacrae</i> L. (Syn. <i>Nepeta hedemceae</i> (L.) Trw)	Lamiaceae	yes

SPECIES	FAMILY NAME	WEED HISTORY OVERSEAS
<i>Gliricidia sepium</i> (Jacq.) Steud	Fabaceae	yes
<i>Gloriosa superba</i> L.	Liliaceae	yes
<i>Glycyrrhiza glabra</i> L. (Syn. <i>G. glandulifera</i> W & K.)	Fabaceae	yes
<i>Grewia asiatica</i> L.	Tiliaceae	no
<i>Gymnocoronis spilanthoides</i> (D. Don) DC.	Asteraceae	yes
<i>Harungana madagascariensis</i> (Choisy) Poiret	Clusiaceae	no
<i>Hedera helix</i> L.	Araliaceae	yes
<i>Hedychium coronarium</i> Konig.	Zingiberaceae	yes
<i>Heterotheca grandiflora</i> Nutt.	Asteraceae	yes
<i>Hiptage benghalensis</i>	Malpighiaceae	no
<i>Hura crepitans</i> L.	Euphorbiaceae	no
<i>Hydrocotyle bonariensis</i> Lam. (Syn. <i>H. umbellata</i> L.)	Apiaceae	yes
<i>Hydrocotyle ranunculoides</i> L.f.	Apiaceae	yes
<i>Hygrophila difformis</i> (L. Q Bl.	Acanthaceae	no
<i>Hymenachne amplexicaulis</i> (Rudge) Nees	Poaceae	yes
<i>Hymenocallis caribea</i> (L.) Herbert	Amaryllidaceae	no
<i>Hypericum androsaemum</i> L.	Clusiaceae	yes
<i>Hypoestes phyllostachya</i> Baker	Acanthaceae	no
<i>Hyptis pectinata</i> (L.) Poit	Lamiaceae	yes
<i>Ilex aquifolium</i> L.	Aquifoliaceae	no
<i>Impatiens walleriana</i> J.D.Hook	Balsaminaceae	no
<i>Ipomoea alba</i> L. Convolvulaceae (Syn. <i>I. bona-nox</i> (L.), <i>Calonyction aculeatum</i> (L.) House)	yes	
<i>Ipomoea quamoclit</i> L. (Syn. <i>Quamoclit pinnata</i> (Desv.) Boj.)	Convolvulaceae	yes
<i>Iris orientalis</i> Miller	Iridaceae	no
<i>Iris pseudacorus</i> L.	Iridaceae	yes
<i>Ixia longituba</i>	Iridaceae	no
<i>Jasminum polyanthum</i> Franchet	Oleaceae	no
<i>Jatropha gossypifolia</i> L. (Syn. <i>Adenoropium gossypifolium</i> (L.) Pohl)	Euphorbiaceae	yes
<i>Juncus acutiflorus</i> Ehrh.	Juncaceae	no
<i>Juncus canadensis</i> Gay.	Juncaceae	no
<i>Juncus inflexus</i> L.	Juncaceae	yes
<i>Khaya senegalensis</i>	Meliaceae	no
<i>Kniphofia uvaria</i> (L.) J.D.Hook	Aloaceae	no
<i>Kochia scoparia</i> (L.) Schrad. (Syn. <i>Bassia scoparia</i> (L.) Scott)	Chenopodiaceae	yes
<i>Koeleruteria elegans</i> (Syn. <i>K. paniculata</i>)	Sapindaceae	no
<i>Lachenalia</i> spp	Liliaceae	no
<i>Lagarosiphon major</i> (Ridley) Moss	Hydrocharitaceae	yes

SPECIES	FAMILY NAME	WEED HISTORY OVERSEAS
<i>Lavandula stoechus L.</i>	Lamiaceae	yes
<i>Leonotis nepetolia R. Br.</i> (Syn. <i>Phlomis nepetaefolia L.</i>)	Lamiaceae	yes
<i>Leucaena leucocephala</i> (Lam.) De Wit (Syn. <i>L. glauca</i> Benth.)	Mimosaceae	yes
<i>Leycesteria formosa</i> Wall.	Caprifoliaceae	no
<i>Ligustrum spp.</i>	Oleaceae	yes
<i>Lilium formosanum</i> Wallace	Liliaceae	no
<i>Linaria vulgaris</i> Mill.	Scrophulariaceae	yes
<i>Lonicera japonica</i> Thunb.	Caprifoliaceae	yes
<i>Lotus corniculatus L.</i>	Fabaceae	yes
<i>Ludwigia longifolia</i> (Dc.) Hara (Syn. <i>Jussiaea longifolia</i> (Dc.) Hara)	Onagraceae	yes
<i>Ludwigia palustris</i> (L.) W Elliot	Onagraceae	yes
<i>Ludwigia peruviana</i> (L.) Hara (Syn. <i>Jussiaea peruviana L., J grandiflora L.</i>)	Onagraceae	yes
<i>Lupinus arboreus L.</i>	Fabaceae	yes
<i>Lupinus polyphyllus</i>	Fabaceae	yes
<i>Macfadyena unguis-cati</i> (L.) A. Gentry (Syn. <i>Doxantha unguis-cati</i>)	Bignoniaceae	no
<i>Macropitium atropurpureum</i> (DC.) Urb.	Fabaceae	no
<i>Mahonia leschenaultii</i> (Wallich) Takeda	Berberidaceae	no
<i>Mareya aristata</i>	Euphorbiaceae	no
<i>Matricaria recutita L.</i> (Syn. <i>Chamomilla recutita</i> (L.) Rauchert)	Asteraceae	yes
<i>Maurandya barclaiana</i> Lindley	Scrophulariaceae	no
<i>Melaleuca spp.</i>	Myrtaceae	no (native)
<i>Mentha piperata L.</i>	Lamiaceae	yes
<i>Mentha spicata L.</i>	Lamiaceae	yes
<i>Miconia calvescens</i> DC. (Syn <i>M magnifica</i> Triana)	Melastomataceae	yes
<i>Mikania spp.</i>	Asteraceae	yes
<i>Monadenia bracteata</i> (Sw.) T Durand & Schinz	Orchidiales	no
<i>Mucuna pruriens</i> (L.) DC. (Syn. <i>Dolichos pruriens L., Strizolobium pruriens</i> (L.) Medic, <i>S. deeringianum</i> Bort., <i>S. aterrimum</i> Piper and Tracey, <i>S. niveum</i> Kuntze)	Fabaceae	yes
<i>Myosotis sylvatica Hoffm.</i>	Boraginaceae	yes
<i>Myrica faya</i> Dryand.	Myricaceae	yes
<i>Neonotonia wightii</i> (Arnott) Lackey (Syn. <i>Notonia wightii</i> Arn., <i>Glycine javanica L., Glycine wightii</i> (Arn.) Verdc.)	Fabaceae	no
<i>Nerium oleander L.</i>	Apocyanaceae	no
<i>Ochna serrulata</i> (Hochst.) Walp.	Ochnaceae	no
<i>Oenanthe pimpinelloides L.</i>	Apiaceae	yes

SPECIES	FAMILY NAME	WEED HISTORY OVERSEAS
<i>Oenothera stricta</i> Link	Onagraceae	yes
<i>Olea africana</i> Miller (Syn. <i>O. europea</i> L. subsp. <i>africana</i> (Vent. P Green)	Oleaceae	no
<i>Olea europea</i> L.	Oleaceae	no
<i>Onopordum illyricum</i> L	Asteraceae	no
<i>Oputia elatior</i> Mill.	Cactaceae	yes
<i>Oputia imbricata</i> (Haw) DC	Cactaceae	yes
<i>Oputia lindheimeri</i> Engelm	Cactaceae	yes
<i>Orbanche ramosa</i> L.	Orobanchaceae	yes
<i>Oxalis</i> spp.	Oxalidaceae	yes
<i>Panicum gilyum</i> Launert	Poaceae	no
<i>Pareitaria judaica</i> L.	Urticaceae	Yes
<i>Parthenocissus tricuspidata</i>	Vitaceae	no
<i>Passiflora mollissima</i> (Kunth) L.Baile	Passifloraceae	no
<i>Paulownia tomentosa</i> (Thunb.) Steud	Scrophulariaceae	yes
<i>Pennisetum alopecuroides</i> (L) Sprengle	Poaceae	yes
<i>Pennisetum macrourum</i> Trin.	Poaceae	yes
<i>Pennisetum polystachion</i> (L) Schultes (Syn. <i>Panicum polystachion</i> L.)	Poaceae	yes
<i>Pennisetum purpureum</i> Schumach.	Poaceae	yes
<i>Pennisetum setaceum</i> (Forssk.) Chiov.	Poaceae	yes
<i>Peperomia lucida</i> , (L.) Kunth. (Syn. <i>Piper pellucidum</i> L.)	Piperaceae	yes
<i>Pereskia aculeata</i> Miller	Cactaceae	yes
<i>Petasites fragrans</i> (Vill.) C.Presl.	Asteraceae	no
<i>Phleum pratense</i> L. (Syn. <i>P. nodosum</i> L.)	Poaceae	yes
<i>Phormium tenax</i> Foster & Foster	Agavaceae	no
<i>Phyllanthus embica</i>	Euphorbiaceae	no
<i>Phyllostachys nigra</i> , • Munro	Poaceae	no
<i>Pinus halepensis</i> Miller	Pinaceae	no
<i>Pinus pinaster</i> Aiton	Pinaceae	yes
<i>Pistacia chinensis</i>	Anacardiaceae	no
<i>Pithecellobium dulce</i> (Roxb.) Benth. (Syn. <i>Mimosa dulcis</i> Roxb.)	Mimosaceae	yes
<i>Plumeria</i> S	Apocynaceae	no
<i>polygala paniculata</i> L.	Polygalaceae	es
<i>Polygala virgata</i> Thunb.	Polygalaceae	no
<i>Populus alba</i> L.	Salicaceae	yes
' <i>Populus nigra</i> L..Salicaceae'	yes	
<i>Praxelis clematidea</i> (Griseb.) R M King & H Rob.	Asteraceae	no
<i>Prosopis</i> spp.	Mimosaceae	yes
<i>Prunus laurocens</i>	Rosaceae	no
<i>Prunus serotina</i> Ehrh.	Rosaceae	yes

SPECIES	FAMILY NAME	WEED HISTORY OVERSEAS
<i>Psidium cattleianum</i> Sabine var <i>littorale</i> Radd. var <i>cattleianum</i> (Syn. <i>PP cattleianum</i>)	Myrtaceae	yes
<i>Psidium guajava</i> L.	Myrtaceae	yes
<i>Psoralea pinnata</i> L.	Fabaceae	no
<i>Puccinellia ciliata</i> Bor.	Poaceae	no
<i>Pupalia lappacea</i> (L.) A.L.Juss.	Amaranthaceae	yes
<i>Pyracantha augustifolia</i> (Franchet) Schneider	Rosaceae	no
<i>Pyrostegia venusta</i> (Ker-Gawler.) Miers (Syn. <i>Bignonia ignea</i> , <i>B. venusta</i>).	Bignoniaceae	yes
<i>Pyrus calleyerana</i>	Rosaceae	no
<i>Pyrus ussuriensis</i>	Rosaceae	no
<i>Quisqualis indica</i> L.	Combretaceae	no
<i>Retama raetam</i> (Forsskal) Webb.	Fabaceae	yes
<i>Rhaphiolepis indica</i> (L.) Ker Gawler	Rosaceae	no
<i>Rhus radicans</i> L. (Syn. <i>Toxicodendron radicans</i> (L.) Kuntze, <i>TT negundo</i> Greene)	Anacardiaceae	yes
<i>Rivinia humilis</i> L.	Phytolaccaceae	yes
<i>Rosa X odorata</i>	Rosaceae	no
<i>Rotala rotundifolia</i> Koehne	Lythraceae	yes
<i>Rubus roribaccus</i> Rydb.	Rosaceae	no
<i>Ruellia squarrosa</i>	Acanthaceae	no
<i>Ruellia tuberosa</i> L.'	Acanthaceae	yes (native ?)
<i>Salix spp.</i>	Salicaceae	yes
<i>Sanchesia parvibracteata</i> Sprague and Hutchinson	Acanthaceae	no
<i>Sansevieria guineensis</i> (Jacq) Willd.	Agavaceae	yes
<i>Sansevieria trifasciata</i> Prain.	Agavaceae	no
<i>Schinus molle</i> L. Anacardiaceae	yes	
<i>Schinus terebinthifolia</i> Raddi	Anacardiaceae	yes
<i>Schoenoplectus californicus</i>	Cyperaceae	no
<i>Senecio angulatus</i> L.	Asteraceae	no
<i>Senecio glastifolius</i>	Asteraceae	no
<i>Senna pendula</i> (Willd.) H.Irwin & Barneby (Syn. <i>Casii bicapsularis</i> L.)	Caesalpiniaceae	no
<i>Sesbania cannabina</i> (Petz) Pers. (Syn. <i>S. aculeata</i> Poir, <i>S bispinosa</i> Steud. ex Wight)	Fabaceae	yes (native)
<i>Sesbania punicea</i> (Cav.) Benth. (Syn. <i>Daubentonia punicea</i> (Cav.) DC.)	Fabaceae	yes
<i>Spathodea campanulata</i>	Bignoniaceae	yes
<i>Steirodiscus chrysanthemoides</i>	Asteraceae	no
<i>Stephanophysum longifolium</i> Pohl.	Acanthaceae	no
<i>Succowia balaerica</i>	Fabaceae	no

SPECIES	FAMILY NAME	WEED HISTORY OVERSEAS
<i>Syagrus romanzoffianum</i> (Syn. <i>Arecastrum romanzoffianum</i>)	Arecaceae	yes
<i>Synedrella nodiflora</i> Gaertner.	Asteraceae	yes
<i>Syngonium podophyllum</i> Schott	Araceae	yes
<i>Syzygium jambos</i> (L.) Alst. (Syn. <i>Eugenia jambos</i> L.)	Myrtaceae	yes
<i>Tamarix aphylla</i> (L.) Karsten (Syn. <i>T articulata</i> , <i>T orientalis</i>)	Tamaricaceae	yes
<i>Tecoma stans</i> (L.) Kunth	Bignoniaceae	yes
<i>Tecomaria capensis</i> (Thunb.) Spach. (Syn <i>T articulata</i> , <i>TT orientalis</i>).	Bignoniaceae	no (native?)
<i>Tephrosia glomeruliflora</i> Meissner	Fabaceae	no
<i>Thaumastochloa danielii</i>	Marantacea	no
<i>Thevetia peruviana</i> (Pets.) K.Schum. (Syn. <i>T neriiifalaa</i> , <i>Cascabela thevetia</i> (L.) Lippold)	Apocynaceae	yes
<i>Thunbergia alata</i> Sims	Acanthaceae	yes
<i>Thunbergia grandiflora</i> Roxb.	Acanthaceae	yes
<i>Thunbergia laurifolia</i> Lindl. (Syn. <i>TT harrisii</i> Hook.)	Acanthaceae	no
<i>Tribolium uniolae</i> (L.f.) Renvoize (Syn. <i>Plagiocbloa uniolae</i>)	Poaceae	no
<i>Turbina corymbosa</i> (L.) Raf.	Convolvulaceae	no
<i>Wedelia trilobata</i> , (L.) Hitchc. (Syn. <i>Silphum trilobatum</i>)	Asteraceae	yes
<i>Xanthosoma vi</i>	Araceae	no
<i>Yucca aloifolia</i> L.	Agavaceae	no
<i>Zebrina pendula</i> Schnitzl. (Syn. <i>Tradescantia zebrina</i> Hort. ex Bosse)	Commelinaceae	yes
<i>Zephyranthes grandiflora</i> Lindley	Liliaceae	no
<i>Ziziphus mucronata</i> Willd.	Rhamnaceae	yes

Table 2. Potential environmental weed species (derived from Table 1) that have histories as weeds overseas and are vulnerable to eradication in Australia.

SPECIES	FAMILY NAME	PROBABILITY OF ERADICATION
<i>Acacia</i> spp. (incl <i>A. catechu</i> , <i>A. karroo</i> , <i>A. sieberiana</i>)	Mimosaceae	High
<i>Alnus rubra</i> Bong. (Syn. <i>A. serrulata</i> Willd.)	Betulaceae	Medium
<i>Aloe ferox</i> Mill	Aloeaceae	High
<i>Ardisia humilis</i> V.	Myrsinaceae	Medium
<i>Barleria prionitis</i> L.	Acanthaceae	Medium

SPECIES	FAMILY NAME	PROBABILITY OF ERADICATION
<i>Brillantaisia lamium</i> Benth.	Acanthaceae	Low
<i>Calluna vulgaris</i>	<i>Ericaceae</i>	Low
<i>Cedrela adorata</i>	Meliaceae	Medium
<i>Chromolaena</i> RM.KING and H Robinson (Syn. <i>Eupatoriurr L</i>)	Asteraceae	Low
<i>Clerodendnurr Chinese (Osb.)</i> Mabblerley (Syn. <i>C. fragrans</i> (Vent.) Willd., <i>C. fragrans</i> var. <i>multiplex</i> (Sweet) Moldenke, <i>C. philippinum</i> Schauer)	Verbenaceae	High
<i>Coccinia grandis</i> (L.) Voigt. (Syn <i>C.cordifolia</i> (L.) Cogn. <i>Bryonia grandis L.</i>	Cucurbitaceae	Low
<i>Cynoglossum creticum</i> Mill.	Boraginaceae	Low
<i>Diplachne uninervia</i> (Syn. <i>Leptochloa uninervia</i> (Presl.) Hitchc. & A. Chase, <i>Megastachya uninervia</i> Presl.)	Poaceae	Low
<i>Equisetum spp.</i>	<i>Equisetaceae</i>	Low
<i>Gymnocoronis spilanthoides</i> (D.Don) DC.	Asteraceae	Low
<i>Kochia scoparia</i> (L.) Schrad. (Syn. <i>Bassia scoparia</i> (L.) Scott)	Chenopodiaceae	Low
<i>Lagarosiphon major</i> (Ridley) Moss	Hydrocharitaceae	Medium
<i>Ludwigia longifolia</i> (Dc.) Hara (Syn. <i>Jussiaea longifolia</i> (Dc.) Hara	Onagraceae	Low
<i>Miconia calvescens</i> DC. (Syn. <i>M magnifica</i> Triana)	Melastomataceae	High
<i>Mikania spp.</i>	Asteraceae	High
<i>Myrica faya</i> Dryand	Myricaceae	High
<i>Opuntia lindheimeri</i> Engelm.	Cactaceae	Low
<i>Pereskia aculeata</i> Mill.	Cactaceae	Low
<i>Pithecellobium duke</i> (Roxb.) Benth. (Syn. <i>Mimosa dulcis</i> Roxb.)	Mimosaceae	High
<i>Rhus radicans</i> L. (Syn. <i>Toxicodendron radicans</i> (L.) Kuntze, T <i>negundo</i> Greene)	Anacardiaceae	High
<i>Rotala rotundifolia</i> Koehne	Lythraceae	Low
<i>Sesbania punicea</i> (Cav) Benth. (Syn. <i>Daubentonia punicea</i> (Cav) DC.)	Fabaceae	High
<i>Syzygium jambos</i> (L.) Alst. (Syn. <i>Eugenia jambos</i> L.)	Myrtaceae	Low
<i>Thunbergia grandzflora</i> Roxb.	Acanthaceae	Low
<i>Ziziphus mucronata</i> Willd.	Rhamnaceae	High

4.2 Information on potential environmental weed species listed in Table 2.

Mimosaceae *Acacia* spp.

(all non-native species,
except *A. nilotica*)

Summary

At least 42 species of non-native *Acacia* have the potential to become major environmental weeds in Australian grassland and open woodland ecosystems. These species possess biological attributes similar to one of Australia's worst environmental weeds *Acacia nilotica* subsp. *indica*. Several species are currently restricted to gardens and zoos and must be removed. One species is in its very early stages of spread.

Description

There are more than 1,100 species of *Acacia*. Some species are small shrubs whereas others are tall trees, typical of the African savanna. *Acacias* generally produce creamy yellow or orange, spherical or elongated, 'powder puff' flowers and large numbers of pods. Due to the large number of species, a full description of the genus will not be attempted here.

Acacias reproduce primarily by seed, although several species can regenerate by producing root-suckers (usually after the parent tree has been damaged). The seeds of most African species are dispersed by either wind or ungulates (Coe and Coe 1987, Tybirk 1991). *Acacias* typically produce copious quantities of seeds. Story (1952) estimated that large *Acacia karroo* trees produce up to 19,000 seeds per annum. Other species generally produce between 5,000-100,000 seeds per tree (Wickens 1969, Tolsma 1989, Tybirk 1989, 1993). The seeds of *Acacia* species are long-lived with seed dormancy well adapted to a strategy of dispersal over time (Coe and Coe 1987). Buried seeds of *A. karroo* remain viable for up to seven years (du Toit 1972) and seeds of some Australian species are still viable after 50 years (Farrel and Ashton 1978). *A. sieberiana* has been reported to develop a soil seed bank of some 800 seeds per square metre (Sabiiti and Wein 1987). *Acacia* seeds are usually 'packaged' in nutritious pods that are relished by grazing animals. The hard-coated seed is scarified in the digestive tracts of cattle and most seeds pass through unharmed. As such, the plants may have evolved a strategy to facilitate dispersal by animals. In some species, the pods can be carried by floodwater. In Queensland, the seed pods of *A. nilotica* (prickly acacia) are dispersed in water flowing along artesian 'bore drains'.

Weed Status

Holm *et al.* (1979) listed 42 species of non-Australian *Acacia* species considered to be weeds in one or more countries around the world. Wells *et al.* (1986) listed 45 species of *Acacia* as problem plants in South Africa. The majority of the latter species are indigenous to Africa. Most problematic *Acacia* species produce dense thickets that exclude grasses and other vegetation. Land management regimes may influence the development of dense stands of African *Acacias*. For example, *A. mellifera* has been reported to form particularly dense stands in arid, African savanna (Botswana) in areas where overgrazing has resulted in reduced grass cover and the loss of regular fires (Christina 1991). One of the most troublesome species is *Acacia karroo*. In its native homeland of southern Africa, *A. karroo* has invaded grazing lands, native vegetation and in some areas occurs as a dominant part of river bed vegetation (Scott 1991). In the eastern Cape Province, *A. karroo* occurs at densities of 1,000-2,000 trees/ha (Aucamp 1976).

Distribution

The majority of Acacias are native to dry, tropical and sub-tropical regions within Australia, Africa and South America. Most species that have histories as major weeds occur in Africa. Of these, some species are limited to either tropical Africa, extending into arid regions such as Egypt, whereas others occur in either central, eastern, western or southern Africa. Some species are widespread across a broad range of climates. Some of the most problematic species of thorny African Acacias grow prolifically in open grassland/woodland (referred to as `savanna). Some species, such as *A. albida*, are common on alluvial soils associated with rivers and creeks (Skerman 1977).

The majority of African and South American *Acacia* species have not yet been introduced into Australia. One species, *A. nilotica* subsp. *indica* was imported last century and has spread over some seven million hectares of native Mitchell grassland in Queensland (Mackey 1996). Several other species are restricted to gardens, fodder tree trial sites and zoo enclosures. *A. arabica* (possibly synonymous with *A. nilotica*), *A. giraffae* (syn. *A. erioloba*) and *A. xanthophloea* were detected in the South Perth Zoo (Scott, unpubl.). Naturalised and cultivated specimens of *A. karroo* were detected at several sites in Western Australia but all specimens have since been removed (Dodd pers. comm.). A single specimen of *A. xanthophloea* was removed from a garden near Brisbane in 1992. Isolated stands of *A. catechu* (syn. *Mimosa catechu*) are reported to occur around the Darwin high school and botanic gardens (Parsons and Cuthbertson 1992). *A. tortilis* and *A. senegal* are currently offered for sale in a `mail order' seed catalogue produced by a New South Wales company. Other specimens of non-native Acacias are occasionally detected in zoos and wildlife parks (there is an emerging trend for zoos to re-create the native surroundings of captive animals). Of concern is the promotion of non-native *Acacia* trees as fodder trees in the international literature. Although some Acacias provide nutritious cattle fodder, they inevitably become environmental weeds on non-grazing land.

Potential Impact

Ross (unpubl.) listed 28 species of non-native *thorny Acacia* considered to have weed potential in Australia. Many non-indigenous *Acacia* species possess characteristics identical to one of Australia's worst weeds, prickly acacia (*A. nilotica* subsp. *indica*), viz. rapid growth, ability to fix atmospheric nitrogen, thorns, high fecundity and dispersal by domestic cattle. In addition, many species are weedy in their countries of origin and have well documented histories as major weeds of rangelands. As such, the majority of species are considered to have the potential to duplicate the problems currently being experienced with prickly acacia. In particular, *A. karroo* has the potential to invade open grasslands and rangelands over much of south-eastern Australia (Scott 1991).

Native grasslands and woodlands throughout Australia are prone to invasion by one or more species of non-native *Acacia*. Invasion may be accelerated in some areas where grazing by sheep or cattle has removed much of the natural ground cover. In addition, the hard seeds of Acacias are readily transported in the digestive tracts of cattle (sheep tend to destroy the seed). Open vegetation in areas where annual rainfall is below 1000mm per annum are considered most at risk and it is unlikely that non-native *Acacia* species would become significant problems in dense forest (eg. wet sclerophyll forest, rainforest or wetlands). Some species, however, could invade coastal dune vegetation in much the same way as some of Australia's coastal Acacias have invaded coastal vegetation in South Africa. Once planted in a suitable habitat, spread of non-native *Acacia* species could be rapid. The development of dense thickets of non-native *Acacia* species may exclude existing native grasses and other native vegetation. Every effort should be made to ensure that non-native Acacias are detected and removed.

Betulaceae

***Alnus rubra* Bong.**

Syn. *Alnus serrulata* (Willd.)

Red alder, smooth alder, Oregon alder

Summary

Alnus rubra is a deciduous, North American tree with the potential to become an invasive species in Australia. It has been planted as a garden ornamental and might be planted *en masse* in the future as a source of timber. Germination requires high soil moisture and subsequent growth is most rapid under conditions of full sunlight. In the north west coastal forests of the United States, it has formed monotypic stands on logged areas and other significantly disturbed lands. Climatically, *A. rubra* is best suited to humid (high rainfall) temperate zones of southern Australia and is unlikely to become invasive on land that is not subject to some form of logging or clearing. Since the plant has not yet become naturalised in Australia, protocols for early detection and eradication should be considered.

Description

A. rubra is a deciduous tree up to 40m tall (Ellison 1995). It is popular as a garden ornamental. Propagation is by means of seed or cuttings. The plant is highly shade-intolerant and establishment rates are highest on open sites (Haeussler *et al.* 1995). Optimum germination and growth rates occur under conditions of high soil moisture (Haeussler *et al.* 1995). In the United States, there is increasing recognition of the plant's value as a source of hardwood timber and its ability to increase soil nitrogen and soil organic matter (Hawkins and McDonald 1993, Haeussler *et al.* 1995). Although the tree is not a legume, it develops root nodules that contain a species of *Actinomyces* fungus capable of fixing atmospheric nitrogen.

Weed Status

A. rubra is a weed along the north-western coast of the United States where it competes with more valuable conifers and redwoods in commercial timber plantations (Wall 1994).

Distribution

A. rubra is native to the low elevation coastal zone of north-western North America, from Alaska to central California, where it is one of the most common broad-leaf tree species. It has been planted in Europe and New Zealand as a garden ornamental and to provide windbreaks. Despite being planted in large numbers, *A. rubra* does not appear to have naturalised in Australia.

Potential Impact

In coastal areas of north-western United States, *A. rubra* behaves as a pioneer species in the early stages of forest successions. Establishment rates increase in response to increasing forest disturbance and soil moisture. Early successional stages are often characterised by either monospecific stands of *A. rubra* or stands of *A. rubra* growing in association with conifers (Hawkins and McDonald 1993). The plant can form thickets in riparian areas (Grieve 1996) and on other sites, provided soil moisture is adequate (Haeussler *et al.* 1995). In Australia, the plant has the potential to escape cultivation and become naturalised in logged areas and along the banks of creeks and rivers, particularly where the original vegetation has been removed or severely modified. Climatically, the plant appears suited to humid (high rainfall) temperate zones, including much of Tasmania and parts of Victoria.

Aloeaceae

***Aloe ferox* Mill.**

bitter aloe, cape aloe

Summary

A. ferox is a succulent shrub that is listed as a weed in South Africa. It has the potential to naturalise in temperate and sub-tropical regions of Australia, including semi-arid areas. Since the plant is restricted to the Melbourne botanic gardens and a small number of gardens in other areas of Australia, eradication appears feasible.

Description

A. ferox is a perennial, succulent shrub (to c. 3m) with an erect, woody stem and large spikes of bell-shaped, orange flowers. The leaves form a rosette and are fleshy, acuminate, with heavily spined margins. Reproduction occurs from seeds.

Weed status

Recorded as a weed of pastures, roadsides and wastelands in South Africa (Wells *et al.* 1986).

Distribution

A. ferox is native to South Africa (Bodkin 1986). It has been recorded to occur in the Royal Botanic Gardens (Melbourne) and in Tasmanian gardens (Tasmanian herbarium). It may also exist within displays of succulent plants in other botanic and private gardens. There are no records of naturalised specimens in Australia.

Potential impact

Although the plant prefers sub-tropical and temperate climates, it is not dependant on a particular rainfall pattern. According to Bodkin (1986), the plant is "adaptable to most soils and conditions and is drought resistant". As such, it has the potential to naturalise over a broad area of southern Australia, including semi-arid regions. It is difficult to predict what impact the plant may have on Australian native vegetation and there is a possibility that it may be restricted to roadsides and other heavily disturbed habitats, as occurs in South Africa.

Myrsinaceae

***Ardisia humilis*
Vahl**

Summary

Ardisia humilis has become a weed in Hawaii and is considered to be in its very early stages of spread in Australia. The plant is currently being sold as a garden ornamental in several states and continued sale will undoubtedly accelerate the plant's spread into bushland. It has naturalised in the Northern Territory over the past 5-10 years, probably assisted by birds which feed on its berries. Currently, the shrub exists as isolated specimens in riparian vegetation

within areas of dry rainforest associated with the monsoon belt of northern Australia. In these areas, it could increase in abundance at the expense of indigenous species.

Description

A. humilis is an ornamental shrub growing to about 2m tall. It has been planted in tropical and sub-tropical parks and gardens in many countries (Ellison 1995). The plant produces pink flowers (c. 2cm in diameter), followed by bunches of small, round, dark purple fruits that are readily eaten by birds. The natural pigments in the fruits are being investigated for use as food colorants (Baldini *et al.* 1995). The leaves are glossy green, 10-20 cm long and 3-4 cm wide. Growth is most prolific in fertile, moist soils in shaded positions (Bodkin 1991).

Weed Status

A. humilis is a weed in Hawaii (Holm *et al.* 1979) and has naturalised in the Antilles (Baldini *et al.* 1995).

Distribution

A. humilis is considered native to India (Baldini *et al.* 1995). It was not recorded in Australia in 1990 (Hnatiuk 1990) but is now widely available through Queensland nurseries (Lawson 1996) and in Western Australia (Waterhouse *pers. comm.*). In the Northern Territory, Cowie (*pers. comm.*) reports that *A. humilis* is cultivated in gardens and has naturalised in the last 5-10 years. Isolated, naturalised specimens exist in riparian vegetation within areas of dryrainforest associated with the monsoon belt of northern Australia. Eradication may be feasible.

Potential Impact

Climatically, *A. humilis* appears well suited to the monsoon zone of northern Australia as well as the tropical and sub-tropical coastal humid zones along eastern Australia. It is considered to be in its very early stages of spread in the Northern Territory. Continued cultivation for ornamental purposes in tropical, high rainfall areas could accelerate the plant's spread into riparian habitats. The plant might become established as an understory shrub within areas of rainforest.

Acanthaceae

***Barleria prionitis* L.**

barleria

Summary

B. prionitis is a thorny shrub which has naturalised at several locations in the Northern Territory and Queensland. It has a history as a weed in Mauritius and could invade native vegetation throughout tropical and sub-tropical, coastal areas of Australia. Although the plant is a popular garden ornamental, there appears to be an opportunity to eradicate naturalised specimens and prevent further sale by the nursery trade.

Description

B. prionitis is a robust, prickly shrub (up to 75cm high) with 3-5 spines, 1-2cm long occurring in the lower leaf axils (Barker 1986) (Plate 1). The inflorescence is spike-like, with yellow, single flowers. The leaves are ovate (10-13cm long and 4cm wide) ending in a short

Acanthaceae

***Brillantaisia lamium* Benth**

Summary

Brillantaisia lamium is thought to be a recent introduction into Australia. It was first recorded in 1996 near Innisfail in north Queensland. As it forms monospecific stands on disturbed land in western Africa, it has weed potential in Australia. Unfortunately, there is a lack of information in the literature upon which to make an assessment of its potential impact on Australian plant communities. Considering the plant's very limited distribution, eradication is a wise precaution.

Weed Status

B. lamium is a weed in western Africa, where it has formed a dense understorey within plantations of oil palm, cocoa, coffee and bananas (Sidwell *pers. comm.*).

Distribution

B. lamium is native to tropical west Africa. It was first collected in 1996 near Innisfail, north Queensland and was previously unknown in Australia.

Potential Impact

B. lamium is weedy in west Africa, where it colonises recently disturbed land and occasionally forms large, monospecific stands. It prefers tropical climates and has the potential to persist in northern Australia. Although it is difficult to predict its potential impact on native plant communities, it is likely to be an opportunistic species that could rapidly colonise disturbed areas such as roadsides, agricultural clearings and perhaps gaps created in forest canopies. It prefers damp areas and could be restricted to coastal areas and riparian habitats.

Ericaceae

***Calluna vulgaris* Salisb.**

Scotch heather

Summary

Calluna vulgaris forms the dominant component of the vegetation over some two million hectares in the uplands of Scotland, England and Wales. It has naturalised in New Zealand's Mt Tongariro National Park, where it competes with a wide range of native plant species. In Australia, *C. vulgaris* has only naturalised in Tasmania and is not yet widespread. *C. vulgaris* could become an invasive weed in alpine and sub-alpine areas of Victoria, southern New South Wales and the ACT. At present, the plant is being sold as a garden ornamental. Eradication of naturalised plants and restriction on further cultivation are recommended.

Description

C. vulgaris is a highly variable, small-foliaged, evergreen shrub which has more than 50 ornamental varieties, such as "white heather" (*C. vulgaris* var. *alba*). The plant can be found in nursery catalogues throughout North America, Great Britain and Europe and is very popular as a garden ornamental due to its prolific flowering. Reproduction usually occurs from seeds but the plant can regenerate by layering (adventitious rooting) of stems (MacDonald *et al.* 1995). Growth habit can vary from prostrate mat-like forms to hemispherical bushes and dwarf tree shapes, depending on factors such as degree of browsing, wind-clipping or the density of surrounding vegetation (Gimingham 1960). In Britain, it usually grows to less than 0.8m, occasionally to 1.25m, and its stems are usually less than 20mm in diameter (Beijerinck 1940, Gimingham 1960). Stands of *C. vulgaris* develop through four stages; pioneer, building, mature, and degenerate. Many British land managers believe regular burning is essential for the maintenance of *Calluna* cover on moorlands (MacDonald *et al.* 1995). If *Calluna* is not burned, gaps develop in the canopy in the "degenerate stage" of stand development.

Weed Status

- *vulgaris* is recorded as a weed in Finland (Holm *et al.* 1979). It is a major environmental weed in Tongariro National Park in New Zealand, where it competes with native vegetation in a wide range of plant communities at altitudes between 600m and 1600m (Bagnall 1982, Chapman and Bannister 1990, 1995).

Distribution

- *vulgaris* is distributed throughout south-west, west and northern Europe and occurs in isolated parts of Asia and northern Africa (MacDonald *et al.* 1995). *Calluna-dominated* moorland is a semi-natural vegetation type of considerable conservation interest in Europe (MacDonald *et al.* 1995). In the uplands of England, Scotland and Wales, it forms the dominant component of the vegetation over some two million hectares (Bunce 1989, Macaulay Land Use Research Institute 1993). *C vulgaris* has naturalised along the Atlantic coast of North America, between Quebec and New Jersey, and in New Zealand. The plant prefers temperate climates and thrives in relatively poor, mildly acidic soils associated with coastal areas and mountainous regions. It will grow in wet heath and bog. In New Zealand, it grows in areas that receive 1100-3000mm rainfall per annum.

- *vulgaris* has naturalised in Tasmania (Buchanan 1995) but is not yet widespread. Unfortunately, the plant is currently being sold by nurseries in Western Australia (Waterhouse *pers. comm.*) and possibly other States.

Potential Impact

C vulgaris could become an invasive weed in alpine and sub-alpine areas in Tasmania, Victoria, southern New South Wales and the ACT. Although restricted to small areas in Tasmania, the plant has the potential to spread over much larger areas. As has occurred in New Zealand and parts of Europe, *C vulgaris* could form dense populations covering many thousands of hectares, at the expense of indigenous plant species. Once established, regular fires are likely to help maintain a high density of *C. vulgaris*.

Meliaceae

***Cedrela odorata* L.**

**cigar box cedar,
Mexican cedar, West
Indian cedar**

Summary

Cedrela odorata is a tropical hardwood tree that has been listed as an environmental weed in South Africa. It has been trialed in Australia as a potential timber species but may become invasive in the tropical and sub-tropical humid zones of northern/eastern Australia and the monsoon zone of northern Australia. It has the potential to colonise gaps created in the canopies of sub-tropical and tropical rainforests and dry rainforests of the monsoon belt. Removal of cultivated specimens could prevent the plant's naturalisation in Australia.

Description

C. odorata is a tall (c. 30m), fast-growing, deciduous tree, highly prized for its timber. It is reported to grow well in Australia and has been trialed for commercial use in forestry plantations (L. Capill *pers. comm.*). Immature specimens exhibit monopodial growth with large compound leaves and small leaflets (Gerwing 1995). The seeds are winged at their lower ends to assist wind-dispersal. In the Guanacaste National Park, Costa Rica, the tree has no leaves during the entire dry season, both at the seedling and adult stage (Gerhardt 1993). Optimal growth occurs in moist forest, where it is reported to be "light demanding" (Gerhardt 1993). Plantations in the American tropics have had limited success due to attack by a shoot-boring moth (Carter, in Gerwing 1995). It is grown in Ghana as an avenue tree and the timber has been utilised in boat-building, interior fittings and lightweight furniture (Nokoe 1984). The leaves on mature trees are up to 60cm long, made up of 5-11 pairs of leaflets. The flowers consist of numerous yellowish-green blooms and the bark and foliage have a garlic-like odour when crushed.

Weed Status

It is recorded in the weed flora of South Africa where it has replaced native vegetation in summer-rainfall areas (Wells *et al.* 1986).

Distribution

C. odorata is native to the West Indies and tropical America and can be found along the Pacific coast of Mexico from the State of Silanoa (lat. 26 degrees N) reaching Central America, the Caribbean Islands and South America, as far south as north east Argentina. It exists in dry and moist forests in the Amazon Basin, extending to the states of Goias, Mato Grosso, Maranhao and north eastern Bahia, Espirito Santo and Rio De Janeiro (Styles 1981 in Lisboa 1994).

Despite being planted extensively in forestry trials throughout Queensland (L. Capill *pers. comm.*), *C. odorata* is not known to have naturalised in Australia (Hnatiuk 1990). A number of specimens exist in gardens (Queensland herbarium records).

Potential Impact

C. odorata is similar to native cedars and there is concern that it might fill a similar niche (L. Capill *pers. comm.*). The plant appears well suited to coastal, tropical and sub-tropical areas of Australia, including the monsoon zone. In a field study in Costa Rica, Gerhardt (1993) found that 5% of planted *C. odorata* seedlings survived in open pasture whereas 20% survived when

Weed status

C. odorata has been recorded as a weed in 22 countries (Holm *et al.* 1979). Under favourable conditions, it forms dense thickets 2-5m high, choking out all other vegetation. In South Africa, *C. odorata* is a significant weed in national parks (MacDonald 1983). In India, Nigeria and south-west China, it forms dense, tangled masses in plantations of teak and other trees. The mass of dry stems produced in the dry season is considered to pose a serious fire hazard in several countries (McFadyen, *pers. comm.*).

Distribution

C. odorata is native to the rainforests of Central and South America, from Mexico to Bolivia and possibly to the West Indies (DPIE 1988). International trade and travel has assisted the plant's spread around the world and it now occurs throughout tropical and sub-tropical areas of Africa, America and Asia. It was introduced into Calcutta in the 1840's. By the 1940's it had spread to become a major weed in Sri Lanka, South-east Asia and Nigeria (and by the 1980's into Irian Jaya, New Britain and Micronesia). *C. odorata* is predicted to become widespread in equatorial Africa, the Pacific and northern and eastern Australia. Tree clearing for agriculture and other development appears to facilitate spread of the plant, which is quick to colonise roadsides, forest edges, plantations and pastures.

C. odorata was discovered for the first time in Australia by quarantine botanist, Barbara Waterhouse, on 15 July 1994 at Bingil Bay, north Queensland. Soon after, the Queensland Government's Department of Natural Resources discovered additional infestations along several kilometres of the banks of the Tully river and a small tributary, Echo creek. The seed of *C. odorata* is believed to have been originally imported into Queensland as a contaminant of pasture seed used on a grazing property in the 1960's and 1970's.

Potential impact

C. odorata has the potential to rapidly colonise disturbed sites in tropical and sub-tropical rainforests, primarily along riverbanks and forest edges in areas where rainfall exceeds 1000mm per annum. It might grow in areas that receive as little as 800mm annual rainfall, at least in riverine habitats (McFadyen, unpubl.). Rapid colonisation is made possible by the copious production of wind-dispersed seeds that can be blown over several kilometres. The weed does not tolerate heavy shade, as occurs under intact rainforest canopies. Agricultural districts, where original rainforest cover has been fragmented into small reserves and corridors, is particularly vulnerable to invasion. Dense infestations of *C. odorata* may delay or block natural successional processes that would otherwise occur following disturbance to rainforest canopy cover (eg. following storm damage), a problem comparable to *Lantana camara* in eastern Australia. Dense growth of *C. odorata* could increase the frequency and intensity of fire, causing further damage to rainforest remnants. Gallery forests and vine thickets are important natural remnants in northern Australia and *C. odorata* may have the potential to damage such communities.

Following an intensive public awareness campaign and survey of the distribution of *C. odorata* in 1994, the Queensland Department of Natural Resources sought Federal and State Government funding for a five year eradication program (1994-1999). The program, costing some \$800,000, utilises field staff from the Department's SWEEP Program ("Strategic Weed Eradication and Education Program") working in cooperation with Local Government staff and other relevant agencies. The Department is optimistic that total eradication can be achieved, provided long-term funding can be maintained. Treated sites will need to be monitored for many years to ensure all seedlings are killed and to ensure surrounding districts have not been infested by wind-blown seed.

Verbenaceae

***Clerodendrum chinense* (Osb.) Mabberley**

Syn. *C. fragrans* (Vert.)
Willd.. *C. fragrans* var
multiplex (Svieet)
Moldenke, *C. philippinum*
Schauer

**fragrant
clerodendrum,
Honolulu rose,
Spanish jasmine,
glory bower**

Summary

Under favourable conditions, *Clerodendrum chinense* can form dense thickets that exclude most other plant species. It has a history as a weed in West Polynesia, Hawaii, Puerto Rico, Fiji and the United States. There are no records of naturalised specimens in Australia and the plant appears to exist only in several botanical gardens. Eradication appears to be feasible and is recommended.

Description

C. chinense is a perennial shrub, 1.2 - 2.4m tall, with attractive, dense terminal heads of white-pink-mauve flowers. The flowers are fragrant and often sterile. The leaves are large (6-20cm long), opposite and simple with variable margins. Unlike most species of *Clerodendrum*, which are reported to be spread by birds (Ridley 1930, Moldenke 1985), *C. chinense* reproduces primarily from root suckers. There are numerous *Clerodendrum* species cultivated as ornamentals and the taxonomy of the genus is confused by artificial varieties and hybridisation. The taxonomy of *C. chinense* is also confused and there are many varieties of the species (eg. *C. philippinum* var *subfertile* and *C. philippinum* var *pleniflorum*).

Weed Status

C. chinense is a weed in West Polynesia, Hawaii, Puerto Rico, Fiji and the United States (Holm *et al.* 1979). It is also a weed in the Cook Islands, in Niue, Pohnpei and the Federated States of Micronesia. It is spreading and becoming a weed of importance in Fiji (MacFarlane, South Pacific Commission Plant Protection Service, Fiji, *pers. comm.*). Five other species of *Clerodendrum* have been recorded as weeds (Holm *et al.* 1979).

Distribution

C. chinense is native to southern Asia. It also exists in Mexico (at Chiapas) and Nicaragua (at Matagalpa, at an altitude of some 1400m) (Rueda 1993). In Queensland, cultivated specimens were recorded in Ipswich in 1976 and in the Brisbane Botanical Gardens (Mt Coot-tha) in 1995 (Queensland herbarium). *C. philippinum* var *pleniflorum* is currently growing in the Brisbane Botanical Gardens, Mt Coot-tha (Cameron *pers. comm.*). It was grown in the Flecker Botanical Gardens in Cairns in the late 1980's but is no longer present (Wilmington *pers. comm.*). It is not known in the Queensland nursery trade (Lawson 1996).

Potential Impact

C. chinense has the potential to form dense thickets that might prevent regeneration of native plant species. There is no information available regarding its impact on native ecosystems in other countries, but it is known to be a highly invasive weed of disturbed areas. The plant appears best suited to high rainfall (> 1000mm per annum), tropical and sub-tropical climates and may become invasive in coastal regions of northern and eastern Australia.

Cucurbitaceae

***Coccinia grandis* (L.) Voigt**

Syn. *Bryonia grandis*
L., *C. cordifolia* (L.) Cogn.

ivy gourd

Summary

Coccinia grandis is a significant environmental weed in Hawaii, where it has smothered remnant native vegetation. The plant has been detected in Western Australia, where it has caused concern due to its ability to overtop and smother shrubs and trees. Although there is some doubt as to whether the species is in fact introduced, there is concern that *C. grandis* could invade a range of habitats in northern Australia. At present, the plant exists as small, scattered populations that appear susceptible to eradication.

Description

C. grandis is an aggressive perennial vine which can readily cover large shrubs and trees. It is dioecious and produces large, white, star-shaped flowers. The fruit is an oval, hairless gourd, the size of a small gerkin, which is bright red when ripe. The roots and stems are succulent and probably enable the plant to survive prolonged drought (Anon 1996). The shoot tips are used in Asian cooking and in India, a sweet variety is cultivated as a food crop. In Hawaii, birds are believed to disperse the plant's fruits (especially the red-vented bulbul, *Pycnonotus cafer*).

Weed Status

C. grandis spread rapidly across Hawaii, after being first identified in 1968. In response, the USDA Division of Plant Industry initiated a biological control research program on the plant. The USDA have warned authorities in Australia to avoid importation of the plant. *C. grandis* has been declared noxious in the Kimberley region of Western Australia but is considered to be a native plant in the Northern Territory (Cowie *pers. comm.*). The plant was recently recorded in Queensland (Queensland Herbarium).

Distribution

C. grandis is believed to be native to central Africa, India and Asia. It is a common weed in south-east Asia. It exists in Texas, Hawaii, the Philippines and the Caribbean (Anon. 1994). In Western Australia, it exists in the Kimberley region. Small infestations have been reported in north Queensland (Waterhouse *pers. comm.*), Arnhem Land, and north-western Australia (Anon. 1994). Specimens have been collected from the Darwin and Gulf regions of the Northern Territory (Hnatiuk 1990).

There appears to be confusion over the plant's origin in Australia. Some people believe it is an exotic species, introduced into Australia from Asia, probably in seed spices (Anon. 1994). Mitchell (*pers. comm.*) suggests it is a recent arrival, possibly introduced along Indonesian fishing routes to the isolated coastal regions of the Northern Territory, where it now occupies remnant vine forests. Dunlop (*pers. comm.*) claims it is a native species and it is also listed by Hnatiuk (1990) as a native species.

Potential Impact

C. grandis appears climatically suited to the monsoon zone of northern Australia, tropical and sub-tropical humid zones of coastal Queensland and northern New South Wales. It could invade dry rainforests of the monsoon zone, tropical and sub-tropical rainforests and riparian

vegetation. It climbs over shrubs and trees, forming a dense, sun-blocking canopy. In Broome (north-west Western Australia), it had invaded suburban gardens but was recently eradicated. Chemical control of *C. grandis*, without causing damage to underlying native vegetation, can be difficult (Whitson 1991).

Boraginaceae

***Cynoglossum creticum* Mill.**

Summary

The first record of *Cynoglossum creticum* in Australia was in 1933. Since that time, the plant does not appear to have spread beyond a single infestation in southern New South Wales. Despite a lack of information in the literature regarding the plant's biology and potential impact, eradication as a precautionary measure may be wise.

Description

C. creticum is a biennial herb growing up to 60cm tall. The stems and leaves are densely pubescent. Flower colour varies from pink to blue with darker venation. The fruits are small, ovoid and densely prickly (Harden 1992).

Weed Status

Holm *et al.* (1979) recorded *C. creticum* as a weed in Argentina and Chile.

Distribution

C. creticum is native to southern Europe. It was collected in 1933 and again in 1975 from a weed-infested slope in the Eden district of New South Wales (McCone *pers. comm.*).

Potential Impact

Considering the plant's overseas distribution, it may survive in the humid temperate and southern sub-humid zones of southern Australia. There is insufficient information in the literature to enable a prediction of the plant's impact on native plant communities in Australia. Eradication should be pursued as a precaution.

Poaceae

Diplachne uninervia

Syn. *Leptochloa
uninervia* (Pres.)
Hitchc. & A. Chase,
*Megastachya
uninervia* Presl.

**Mexican
sprangletop**

Summary

Diplachne uninervia is an annual or short-lived perennial grass which is currently restricted to a single, small infestation in Australia. Eradication appears feasible. If permitted to spread, the plant might invade brackish/saline and freshwater wetlands in sub-tropical and temperate zones.

Description

D. uninervia is an annual or short-lived, tufted perennial to about 70cm tall. It has a large, reddish, open panicle and leaf blades that have prominent white midribs. It is distinguished from similar species in the genus by its smooth sheaths and rounded lemmas which are pointed at their tips (Mohlenbrock 1996). It flowers in summer and is a prolific seeder. The plant appears to prefer moist, sandy soil, pond or lake beds, marshes, disturbed areas and sometimes shallow, slow-moving water (Mohlenbrock 1996). In the south west of the United States, it is common along streams, in ditches and swales and in any bare area that remains wet for prolonged periods (Menn *et al.* 1990).

Weed Status

D. uninervia is a significant weed in Peru and is in the weed flora of Chile and the United States (Holm *et al.* 1979). It is a major weed of irrigated crops in California (Hosking, *pers. comm.*). Two closely related species, *Leptochloa panicea* and *L. chinensis* were listed as high priority potential weeds of concern to northern Australia (Michael 1989).

Distribution

D. uninervia is native to south-western United States. It was first recorded in Australia growing in saline, waterlogged land at Homebush Bay, New South Wales (National Herbarium of New South Wales Annual Report 1994-95). Naturalised specimens have not yet been recorded in Australia.

Potential Impact

D. uninervia thrives in wet areas along the edges of fields, irrigation and drainage channels and has the potential to invade tidal and freshwater wetlands in temperate and sub-tropical zones. Once established in suitable habitats, *D. uninervia* might compete with native grasses, sedges and other wetland plants, perhaps replacing some species and affecting populations of water-birds and other wildlife.

Equisetaceae

***Equisetum* species**

**horsetails,
scouring rush**

Summary

At least three species of *Equisetum* have the potential to become persistent weeds of wetlands and other low-lying areas in Australia. Temperate regions where annual rainfall exceeds 500mm are considered most at risk. To date, only one species, *E. arvense*, has become naturalised (near Sydney) and eradication needs to be pursued. *Equisetum* are occasionally sold as garden ornamentals, garden pond plants and as medicinal herbs. Urgent action is needed to ensure that sale of *Equisetum* species is an offence in every State and Territory.

Description

The genus *Equisetum* is a primitive group of non-flowering, perennial plants widely distributed during the Carboniferous and Devonian eras. Aerial stems are jointed and the inconspicuous leaves that encircle the nodes are fused laterally to form a toothed sheath. Some species have fine branches that are said to resemble horsetails. Stem height generally ranges from 5 - 120cm, but one tropical South American species (*E. giganteum*) may reach 9m. Reproduction is via spores and vegetative growth of underground rhizomes. Some species, such as *E. arvense*, can spread several metres via a system of branched underground rhizomes that can extend to a depth of one metre. Tubers and rhizome fragments can be dislodged and carried in soil or construction equipment to new areas. Introductions of *Equisetum* into New Zealand could possibly be attributed to spores or tubers adhering unnoticed to the roots of iris plants imported from Japan. Spores require prolonged moist conditions to germinate, conditions usually found in wetland habitats. *E. arvense* produces green, sterile stems and pale brown, fertile, cone-bearing stems that die back to the ground each year.

The most comprehensive reviews of *E. arvense* and *E. palustre* are by Holm *et al* (1977) and Cody and Wagner (1981). *EE arvense* is also discussed by Parsons and Cuthbertson (1992).

Weed status

Approximately 30 species comprise the genus, of which 12 are considered weeds. Holm *et al.* (1977) rank *Equisetum* as some of the world's worst weeds of agriculture, due to their resilience, toxicity and propensity to dominate poorly-drained farmland and pastures. Perhaps the most troublesome species are *E. arvense*, *E. palustre* and *E. ramosissimum*, particularly in temperate regions of the northern hemisphere.

Distribution

The genus is found throughout most temperate regions of the northern hemisphere. Eleven species occur in Europe and at least six species can be found in the western United States. *E. arvense* is native to the temperate regions of Europe, North America and Asia. It has spread to New Zealand, Madagascar, South Africa and South America. Most *Equisetum* species inhabit swampy areas but species such as *EE arvense* and *Ee palustre* are also well adapted to open grassland and areas where sandy or gravelly soils have been disturbed by agriculture (Holm *et al.* 1977).

Weed status

G. spilanthoides is recorded as a weed in Argentina (Holm *et al.* 1979) and in India.

Distribution

G. spilanthoides is native to tropical and sub-tropical South America, from Mexico to Argentina (Parsons and Cuthbertson 1992). It has been introduced to a number of countries as an aquarium plant. The first naturalised specimen in Australia is believed to have been taken in 1980 from a drain on Oxley Island in the Manning River near Taree, New South Wales (Parsons and Cuthbertson 1992). Additional infestations are known to exist at four locations from Taree in the north to Dapto in the south of New South Wales (New South Wales Department of Agriculture 1994). An infestation has also been discovered in Tasmania. It is not known to have naturalised in South Australia (Carter 1994). The plant has been sold as an aquarium plant in South Australia and probably all other States. In Queensland, naturalised specimens were recorded for the first time at Redland Bay (near Brisbane) in January 1995. Since that time, other very small infestations (c. < 0.5ha) have been found in Brisbane and in Cedar Creek at Mt Tamborine.

Potential Impact

G. spilanthoides has the potential to invade wetlands and other low-lying land, as well as slow-moving waterways in tropical, sub-tropical and warm temperate climates. The plant's capacity for rapid growth (up to 15cm per week) may enable it to outcompete and replace slower growing native wetland plants, especially in situations where aquatic environments have been disturbed by urban or agricultural development or polluted by fertilisers and other forms of nutrients.

Discussions with the Queensland aquarium trade suggest that *G. spilanthoides* was imported in the 1970's (possibly 1974). It was cultivated and sold widely after 1974 by Pisces Enterprises, one of Australia's largest wholesale producers of aquarium plants (based in Brisbane). As a result, opportunities for naturalisation may have arisen for at least the last 20 years. Since the plant was declared in Queensland in 1992, major wholesale producers of aquatic plants in the State have ceased cultivation. Unfortunately, the plant can be legally cultivated and sold in several other States (NT, WA, Vic, ACT).

Existing infestations are highly localised and relatively small, being limited to New South Wales, Queensland and Tasmania. In Queensland, eradication of several small infestations is being undertaken by the Queensland Department of Natural Resources in cooperation with several Local Governments. At this point, the most significant obstacle to eradication is the deliberate cultivation of the plant in public waterways by small-scale producers of aquarium plants. Eradication from other States is considered feasible and is recommended. Physical removal is practical for very small infestations. For larger infestations, however, chemical control may be the only option.

Chenopodiaceae

Kochia scoparia (L.)
Schrader

Syn. *Bassia scoparia*
(L.) Scott. *Bassia sieversiana* (
Pallas) W.A. Weber. *Kochia alata*
Bates. *Kochia scoparia* [var. curta](#)
Farm, *Kochia scoparia* var.
pubescens Fenzl, *Kochia*
scoparia var. *subvillosa* Moq.,
Kochia scoparia var. *trichophila* (
Stapf) Bailey, *Kochia sieversiana* (
Pallas) C.A. Mey., *Kochia*
trichophila Stapf.

kochia, burning bush,
summer cypress

Summary

Kochia scoparia is a rapidly growing chenopod adapted to a wide range of soil types. In the United States, it is reported to have the highest rate of spread of any weed. Climatically, the plant is suited to much of the sub-humid and semi-arid zones of southern Australia. Dense infestations could suppress recruitment of native ground cover plants and alter natural fire regimes. Due to its potential economic impact, the plant is currently targeted for eradication by State agricultural protection boards in cooperation with the Australian Quarantine and Inspection Service.

Description

K. scoparia is an erect, annual chenopod. It was introduced into the United States as a garden ornamental for its bright red autumn foliage. Specimens may grow to about 1.5m tall and are usually dense, multi-stemmed, spherical bushes. The leaves are flat and elongated with longitudinal veins on the underside (Velterop *et al.* 1992). Flowers are small and indistinct, borne on the leaf axils of the upper portions of the shoots (Velterop *et al.* 1992). Seeds are dispersed over long distances via a "tumbleweed action" which involves the plant breaking off at ground level and scattering seeds as it rolls along the ground (Dodd and Moore 1993). Seeds germinate in a range of temperatures representative of all seasons in Western Australia (Ail-Hock Cheam in Dodd 1993). *K. scoparia* is cross-pollinated and new ecotypes are readily produced (Martin 1992). Its palatability, rapid growth, high productivity, ease of establishment and ability to flourish on saline soil lead to its introduction into Australia for rehabilitation of saline soils in Western Australia. *K. scoparia* can thrive when subjected to irrigation water containing salt levels up to one-third that of sea water (Fuehring *et al.* 1986). Although used for forage, *K. scoparia* can be toxic to stock due to high levels of oxalates and nitrates (Velterop *et al.* 1992).

Weed Status

K. scoparia is a weed in Argentina, Canada and the United States (Holm *et al.* 1991). It was declared noxious in Western Australia in 1992 and is currently the subject of an eradication program funded by Federal and State pest management agencies (Dodd and Moore 1993).

Distribution

K. scoparia is a native to eastern Europe and western Asia and has naturalised over most of Europe and parts of temperate Asia. Despite the plant's well documented impact as a weed overseas, it was deliberately imported into south-west Western Australia in 1990 for use in saline land rehabilitation. By 1992, it had spread away from the original planting sites into crops, pasture, firebreaks, ditches and tracks (Dodd and Moore 1993).

Potential Impact

In the United States, *K scoparia* has the highest rate of spread known for any weed (Dodd *pers. comm.*). From the estimated 750ha planted in Western Australia in 1991 it had infested an estimated 6,000ha within two years and was spreading at the rate of 1-3km per year (Walker 1993). Bioclimatic modelling of the plant's potential distribution indicates that much of southern Australia is climatically suitable for growth, with the cropping lands of south-eastern Australia being particularly at risk (Connell in Dodd and Moore 1993). There is enormous potential for *K scoparia* to have a significant impact on the entire semi-arid, temperate pastoral area as well as temperate and sub-tropical areas (Martin 1992). Dense infestations might suppress recruitment success of native ground cover plants and alter natural fire regimes.

Hydrocharitaceae

***Lagarosiphon
major* (Ridley)
Moss**

**lagarosiphon,
coarse oxygen weed**

Summary

Lagarosiphon major is a submerged, aquatic weed that causes significant problems in South Africa and New Zealand. Although the plant is still restricted to home aquaria in Australia, it has the potential to become a weed of lakes and slow-moving streams throughout temperate and sub-tropical regions of Australia. Under favourable conditions, it could replace native water plants. Every effort should be made to enforce existing restrictions over the cultivation and sale of *L. major* as an aquarium plant.

Description

L. major is a rhizomatous, perennial, submerged aquatic plant that inhabits freshwater lakes, dams and slow-moving streams. It produces sparsely branched stems up to 5m in length which are anchored at the bottom by roots from the nodes. The leaves are arranged singly along the stem in a spiral arrangement (unlike *Elodea* and *Hydrilla*, where they are arranged in whorls around the stems). Male and female flowers occur on separate plants. Since male flowers have not been recorded in Australia, no seeds are produced (Parsons and Cuthbertson 1992). Provided both male and female plants are present, however, reproduction can occur via water-dispersed seed. The plant reproduces vegetatively via broken stem fragments and uprooted plant material. Man has spread this plant around the world for use in home aquaria. *L. major* prefers cool conditions and high light levels (low turbidity) in low nutrient waters on a silty or sandy substrate. It can grow in water as deep as 6.5m (AWRC undated).

Weed Status

L. major has been recorded as a serious weed in New Zealand (AWRC undated, Holm *et al.* 1979) and in South Africa (Wells *et al.* 1986). It has naturalised in England, the Channel Islands, northern France and Italy (Parsons and Cuthbertson 1992, Hafliger and Wolf 1988).

Distribution

L. major is native to Zimbabwe and South Africa (AWRC, undated). In Australia, *L. major* is currently restricted to home aquaria. It naturalised in a dam near Melbourne in 1977 but was removed (Parsons and Cuthbertson 1992).

Potential Impact

In New Zealand, the plant has blocked intakes of hydro-electric systems and has formed dense floating mats in deep-water reservoirs and other water bodies. *L. major* has the potential to become a troublesome weed of lakes and slow-moving streams throughout temperate and sub-tropical regions of Australia. Under favourable conditions, dense growth of the plant can block light penetration into waterways, eliminating growth of native water plants and affecting associated populations of aquatic invertebrates and vertebrates. Once widespread, control would be extremely difficult (as is the case for most submerged aquatics).

L. major has been declared noxious in all States and Territories (except the ACT) and there is a clear opportunity to ensure that this plant is not cultivated or sold as an aquarium plant. Since it is often confused with other water weeds, including *Elodea crista*, *Egeria* and *Hydrilla*, authorities should be aware that the plant may be sold in aquarium shops under erroneous names (a key to the identification of these genera is provided by Bowrner *et al.* 1995). Future cases of naturalisation need to be detected and removed.

Onagraceae

***Ludwigia longifolia* (Dc.) Hara**

Syn. *Jussiaea longifolia* (Dc.) Hara

Summary

Ludwigia longifolia has naturalised near Sydney. Since the population is highly localised, eradication may be possible. If the species is permitted to spread it may become an invasive weed of tropical and sub-tropical wetlands and riparian vegetation (perhaps having an impact comparable to *L. peruviana*).

Description

L. longifolia is an erect shrub up to 2m tall. It has narrowly winged stems that usually branch near their ends. The leaves are sessile, generally lanceolate and 10-15 cm long. The flowers are pale yellow to cream, with notched petals about 2cm long (Everett 1981).

Weed Status

L. longifolia is listed by its synonym, *Jussiaea longifolia* (Dc.) Hara, as a principal weed in Brazil (Holm *et al.* 1979).

Distribution

L. longifolia grows naturally from Brazil to Argentina (Everett 1981). It was first recorded in Australia near Sydney (National Herbarium of New South Wales Annual Report 1993-94).

Potential Impact

Since *L. longifolia* behaves as a weed within its native range, it is likely that it will become weedy when introduced into other countries with similar climates. The plant may have weed potential in tropical and sub-tropical regions, possibly along the eastern and northern coasts of Australia. Ecosystems most at risk include wetlands and riparian communities. Other species of *Ludwigia*, including *L. peruviana* and *L. palustris*, have already invaded wetlands in Australia (the latter species are discussed in Appendix C).

Melastomataceae

***Miconia
calvescens* DC.**

Syn. *M. magnifica* Triana

miconia

Summary

Miconia calvescens is highly invasive in the rainforests of French Polynesia and Hawaii. In Tahiti it forms dense, monospecific stands and poses a serious threat to half of the endemic plant species of French Polynesia. *M. calvescens* is currently growing on the margins of north Queensland rainforests and has the potential to spread into remote areas. It is well suited to the climate of coastal north Queensland and represents a serious threat to 'wet tropics' rainforests. Eradication appears to be achievable and will be pursued in Queensland, following the plant's listing as a noxious weed early in 1997.

Description

M. calvescens is a small tree up to 15m tall. It has large leaves (typically 60-70cm long). A bicolorous form has leaves with, dark green upper sides and purplish-red undersides (Plate 5). The leaves have three prominent veins; one in the midrib and one inside either margin. All stages of flowering and fruiting can occur on a single tree over a prolonged period. The fleshy berries contain up to 200 seeds per fruit and there can be up to 500 fruits per panicle (Loope 1996). Seeds will germinate and grow under very low light conditions, enabling the species to colonise and persist beneath undisturbed rainforest canopies.

Weed Status

M. calvescens is a serious weed in Tahiti and Hawaii. It has also naturalised in Jamaica, the Galapagos and Sri Lanka. In the Hawaiian and Tahitian islands it has formed dense, monotypic stands, displacing indigenous species in rainforest and on disturbed land.

Distribution

M. calvescens is native to Central and South America, where it occurs from about 18 degrees north to about 26 degrees south, and from lowlands to montane forests up to 1800m in elevation. Due to its attractive foliage, it has been grown in European glass houses since the mid-nineteenth century. In Australia, it is grown in both public and private collections; it is grown commercially by a small number of specialist nurseries from northern coastal New South Wales and northern Queensland. It exists in botanic gardens in Melbourne, Sydney, Brisbane and Cairns (Edwards unpubl.) and is recorded in the Herbaria of New South Wales and Victoria. The plant has naturalised in north Queensland near El Arish and Mossman; seedlings have been reported growing in rainforest margins up to 250m from parent specimens.



Photo 5.

Potential Impact

In Tahiti and Hawaii, *M. calvescens* has dominated and transformed rainforest communities by outcompeting both local and exotic species (Loope 1996, Meyer 1996). The dense shade produced by the plant's overlapping foliage has progressively eroded biodiversity to the extent that 35-45 plant species endemic to French Polynesia are threatened (Meyer and Florence, unpubl.).

Modelling the plant's potential distribution using the CLIMEX computer software (Maywald and Sutherst 1989, 1991) suggested that *M. calvescens* could spread over much of coastal, tropical north Queensland (Figure 2). Ecosystems at risk are primarily coastal tropical and sub-tropical rainforests of eastern Australia. Once firmly established, *M. calvescens* might form extensive, mono-specific stands, which may exclude native plants. In Tahiti, the plant's seeds are dispersed by frugiverous birds, especially the silver-eye (*Zosterops lateralis*). Silver-eyes are also common in eastern Australia and are expected to act as a dispersal vector for the plant.

Mr F .R. Fosberg, a botanist from the National Museum of Natural History (Smithsonian Institute) has warned Australian authorities that "no expense be spared to search it out and destroy it before you have a hopeless problem" (in Humphries and Stanton 1992).



Figure 2.

Potential distribution of *Micronia calvescens* in Australia, predicted using the 'CLIMEX' computer program (map produced by Mackey, in Edwards, unpubl.).

Asteraceae

Mikania species

mile-a-minute,
mikania

Summary

The *Mikania* genus contains some 250 species. Four of the most troublesome species are aggressive, rapidly growing vines that have been listed as weeds in at least 35 tropical and subtropical countries. *Mikania* vines can smother native vegetation, especially young trees. Rapid growth and wind-dispersed seed enable *Mikania* vines to quickly dominate any gaps created in rainforest vegetation. *Mikania* have not yet naturalised in Australia, however, a single species was recently detected at a nursery near Brisbane. Once planted in gardens, the wind-blown seed of *Mikania* will be free to disperse into adjacent areas. The four most problematic species are not expected to naturalise outside tropical, coastal areas that receive an annual rainfall of at least 1500mm per annum (the "wet tropics" region of north Queensland is considered to be highly suitable for growth of several species of *Mikania*). Sale of *Mikania* has been banned in Queensland, but there are no restrictions in other States.

Description

The *Mikania* genus contains some 250 species of herbaceous or slightly woody vines (Holm *et al.* 1977) that are invasive, fast growing weeds of plantation crops, forest plantations and native vegetation. Morphological variation within certain species has resulted in considerable confusion between species. The three most problematic species, *M cordata*, *M micrantha* and *M scandens*, are similar in appearance and each is quite variable. *M micrantha* is a branched, slender-stemmed perennial vine. The leaves are arranged in opposite pairs along the stems and are heart-shaped or triangular with an acute tip and a broad base. Leaves may be 4-13cm long. The flowers, each 3-5mm long, are arranged in dense terminal or axillary corymbs. Individual florets are white to greenish-white. The seed is black, linear-oblong, five-angled and about 2mm long. Each seed has a terminal pappus of white bristles that facilitates dispersal by wind or on the hair of animals. *M cordata* is very similar to *M micrantha* but can be distinguished by the membranous outgrowths of young vegetative shoots which are hairy and the involucre bracts which are about 2mm longer than on *M micrantha*. (more detailed descriptions of these three species of *Mikania* are provided by Holm *et al.* 1977).

Mikania produce large amounts of seeds that can be transported by the wind or by adhering to human clothing or the hair of animals. Vegetative reproduction can occur from broken stem fragments that may be dislodged and transported by machinery or by rainfall run-off. Each node of the stem of *Mikania micrantha* can produce roots (Soerjani *et al.* 1987). In Mauritius, Craig and Evans (1946) reported rapid spread of *M cordata* caused by the movement of broken stem fragments by streams and floods. Some species of *Mikania* have been cut and fed to cattle, resulting in spread from uneaten stem fragments. Species of *Mikania* have been transported around the world for use as garden ornamentals. The use of *Mikania* as a cover crop or smother crop to control other weeds in plantations has also resulted in dispersal (Burkill 1935, King 1966, Barnes and Chan 1990).

Weed Status

Mikania species have been ranked as some of the world's worst weeds (Holm *et al.* 1977). Four species, *M. congesta*, *M. cordata*, *M. micrantha* and *M. scandens* have been listed as weeds in 35 countries (Holm *et al.* 1979). The most troublesome species is *M. cordata* which occurs as a weed in 23 countries and is described as a "rapid growing, rampant vine" (Holm *et al.* 1977).

Distribution

Most species of *Mikania* are native to tropical regions of America. *M. micrantha* is native to Central and South America (Waterhouse and Norris 1987) and has become naturalised throughout mainland south east Asia, Indonesia, New Guinea and the Pacific Islands. *M. cordata* is native to south east Asia and East Africa and has become widespread in these areas and in the Pacific Islands. *M. scandens* is found along the Atlantic and Mexican Gulf coasts and in the United States. It extends as far north as New York and west to Texas. *M. cordifolia* is widespread in Central America, Mexico, South America and the West Indies.

Most species of *Mikania* tend to be confined to tropical regions where they become most prevalent in forest clearings, along roadsides, in plantation crops and in riparian habitats.

Potential Impact

Michael (1989) ranked *Mikania micrantha* second (behind *Chromolaena odorata*) in a list of twenty three weed species considered to pose the greatest potential threat to northern Australia. Northern Australia is one of only a few tropical areas in the world that do not support one or more species of *Mikania*. In view of the large number of *Mikania* species (c. 250 species) and their histories as invasive weeds in at least 35 countries, it is highly likely that one or more species will become naturalised in Australia. Several species of *Mikania*, including *M. cordata*, *M. micrantha* and *M. scandens*, have the potential to become naturalised in tropical and sub-tropical areas of Australia, primarily in areas where rainfall exceeds 1500mm per annum. The 'wet tropics' region of north Queensland is highly suitable for growth of these species. Specific habitats at risk may include small remnant patches of rainforest (particularly the edges of remnants), riparian vegetation (including creek banks and the edges of freshwater wetlands) and the early successional stages of cleared rainforest. *Mikania* could prove to be a particularly troublesome plant in areas where rainforest rehabilitation is being attempted. *Mikania* species are unlikely to pose serious threats to large tracts of 'intact' rainforest as they are generally intolerant of dense shade. Like most vines, *Mikania* would be very difficult to control once firmly established. A climbing habit enables *Mikania* to readily penetrate into the crowns of bushes or trees, making chemical or mechanical control difficult without risk of damage to the supporting plant. Areas cleared of *Mikania* need to be monitored for several months since the plant can regrow from any small stem fragments left in the soil.

As yet, species of *Mikania* have not naturalised in Australia. A single species was recently detected by the Queensland Department of Natural Resources at a large wholesale nursery near Brisbane early in 1996. The plant was being sold as 'Mikania' but has not yet been identified to species level. Quarantine controls need to be enforced by the Commonwealth Government to prevent importation of *Mikania*. In addition, a protocol of "early detection and eradication wherever found" should be applied in each State. At present, the most important task for State Government pest management agencies is to ensure *Mikania* vines are not offered for sale by nurseries as either ornamentals or as quick growing ground covers.

Mikania has been controlled in south-east Asia with herbicides such as 2,4-D/picloram (refer to Tjitrosoedirdjo (1990) for application rates). Suitable herbicides would need to be registered for application on *Mikania* in Australia prior to use.

Myricaceae

Myrica faya
Dryand

firebush

Summary

Myrica faya is a significant environmental weed in Hawaii where it has colonised areas disturbed by volcanic activity. The plant has several attributes common to many weeds including high fecundity, bird-dispersed seed, an ability to fix atmospheric nitrogen and freedom from pest and disease. In Australia, *M. faya* only exists in botanic gardens. Removal of all known specimens could prevent the plant's naturalisation. If permitted to spread, *M. faya* could become an invasive weed in sub-tropical and tropical rainforest areas of coastal eastern Australia.

Description

M. faya is an evergreen shrub or small tree up to 6m tall. In its native habitat it occurs as a co-dominant species on old lava flows (Hodges and Gardner 1985) as well as other substrates at higher elevations (Humphries 1979). *M. faya* grows rapidly in open canopied sites. In Hawaii, the diameter growth of *M faya* can exceed that of native dominant species, *Metrosideros polymorpha*, by more than 15:1 (Vitousek and Walker 1989). *M faya* will tolerate a wide range of light regimes, surviving under a closed forest canopy and growing rapidly if a gap is created by tree-fall or some other disturbance. *M faya* has evolved a symbiotic relationship with *Frankia*, a root fungus with the ability to fix nitrogen. This relationship probably improves the growth rate of *M faya* and enables it to compete strongly with surrounding plant species.

M.faya is considered to be dioecious, but "male" plants still produce some fruit and "female" plants a few male inflorescences (Gardner 1985). *MM faya* produces large quantities of fruit; an average adult female tree produces more than 400,000 fruits per year (Whiteaker and Gardner 1987). In a study by Vitousek and Walker (1989), 21 adult *M faya* trees, established in an area of one hectare, produced 4,600,000 seeds. In Hawaii, fruit production is strongly seasonal, peaking between September and December. Trees can produce their first fruit at 4-6 years of age, when they are approximately 3m tall (Vitousek and Walker 1989). The fruits are drupes with a stony endocarp surrounding a single seed (Lawrence 1951). Slow breakdown of the endocarp allows the fruit to remain viable in soil for long periods; a characteristic of many tropical pioneer trees (Uhl and Clark 1983). Walker (1990) reported that fruits in dry storage remained viable after 78 weeks.

M faya is believed to be dispersed by birds and feral pigs (Smathers and Gardner 1979, La Rosa *et al.* 1985) since the hard seed passes unharmed through their digestive tracts. In Hawaii, the main dispersal vector is a the non-native silver-eye, *Zosterops japonica*, although several other bird species also eat the fruit (Vitousek and Walker 1989). In Australia, there are three species of silver-eye (*Z. lateralis*, *Z. lutea* and *Z. citrinella*) which are vagrant species with wide ranges (Lindsey 1992). Should *M. faya* become naturalised in Australia these bird species would be the most likely dispersal vectors.

Weed Status

M. faya is a noxious weed in Hawaii where it was probably imported as an ornamental or medicinal plant in the 1800's (Vitousek and Gardner 1989). It was first noticed in the Hawaii Volcanoes National Park in 1961 and was well established by 1973 when control practices commenced. By 1994, *M.faya* was estimated to occupy 32,000ha throughout Hawaii, mostly in threatened native ecosystems (Duffy and Gardner 1994). In Hawaii, *M. faya* has invaded primary succession sites that were created, over the previous few decades, by volcanic activity. At some of these sites, *M faya* has invaded a sere that lacks native symbiotic nitrogen fixers. Since *M faya* fixes atmospheric nitrogen, it may have the potential to alter the nitrogen budget of invaded areas, perhaps favouring subsequent invasion by other weed species.

In the Hawaii Volcanoes National Park, the most rapid and successful invasion by *M faya* is taking place in open-canopied sites dominated by scattered native trees (primarily *Metrosideros polymorpha*). Such sites occur extensively in the seasonal submontane forests (Mueller-Dombois *et al.* 1981) and in rainforest sites where *Metrosideros* stands have been thinned by volcanic activity. As such, *M faya* is invading primary successional sites as well as large 'gaps' that have been created in established forests. Suppressed individuals also exist among the understorey of closed-canopy rainforest (Vitousek and Walker, 1989). *M faya* also invades abandoned agricultural lands in Hawaii (Walker and Vitousek 1991).

Distribution

M. faya is native to the mid-Atlantic islands of Madeira, the Canary Islands and the Azores. In Australia, it is believed to be restricted to gardens, including the Royal Botanic Gardens in Melbourne. There are no records of naturalised specimens in Australia.

Potential Impact

Myrica faya has several characteristics of a successful invader including its early reproduction, rapid growth, ability to fix atmospheric nitrogen, high fecundity and dispersal by frugivorous birds. It may have the potential to colonise disturbed rainforest communities in tropical and sub-tropical regions of Australia. Once planted in a suitable habitat, its spread could be rapid (aided by native birds such as silver-eyes). Although the plant's attributes suggest that it is an opportunistic "pioneer" species, it could block or delay natural successions occurring in damaged rainforest remnants and reserves. It could become an integrated component of understorey flora within closed rainforests, quickly dominating any gaps created in the canopy.

Cactaceae

***Opuntia
lindheimeri***
Engelmann

Lindheimer prickly
pear, cholla

Summary

Opuntia lindheimeri has the potential to become an invasive weed in semi-arid regions of Australia, primarily in central and southern Australia. Ecosystems most at risk include grasslands and open woodland, especially grazed areas that suffer pasture decline. Eradication appears feasible, provided an effective control strategy can be delineated.

Description

All varieties of *O. lindheimeri* are cool season, perennial succulent shrubs (c. 2m tall) native to north America (Texas). The plant has flattened, modified stems (pads) with spines and hairs in small depressions particularly clustered on the edges (Mayeux and Johnson 1989).

There are several varieties including var. *lehmannii*, var. *linguiformis* and var. *tricolor* (Anon. 1996). Intra-specific variation, combined with the confused taxonomic status of the entire *Opuntia* genus, can result in mis-identification of specimens.

Weed Status

O. lindheimeri is a weed on grazing lands within its native range in North America (Holm *et al.* 1979). Various species of *Opuntia*, including *O. lindheimeri*, occur on approximately 28% of Texan rangelands (Lundgren *et al.* 1980).

O. lindheimeri has become the primary weed problem on many Texan ranches and often requires aerial spraying with herbicides (Petersen *et al.* 1988, Mayeux and Johnson 1989).

Distribution

O. lindheimeri is one of eight *Opuntia* species introduced into Australia since 1970 (Groves 1996). It was recorded in 1982 at the Old Telegraph Station in Alice Springs, Northern Territory (Albrecht *pers. comm.*) and is known to have naturalised in South Australia and Victoria (Hnatiuk 1991). The South Australian State Herbarium has recorded the plant from the Riverland area around Barmera.

Potential Impact

O. lindheimeri has the potential to become a weed in semi-arid regions of Australia, primarily in central and southern Australia. Ecosystems most at risk include grasslands and open woodland, especially areas that have suffered damage by cattle and sheep. In Texas, the plant is proving difficult to control using herbicides and improved results have been achieved in conjunction with burning (Mayeux and Johnson 1989). Eradication of *O. lindheimeri* in Australia may be feasible, provided an effective control strategy can be delineated. If the plant becomes widely established in Australia, control could become difficult and expensive.

Distribution

PP aculeata occurs naturally from Florida to southern Brazil and northern Argentina (Moran and Zimmermann 1991). In Australia, it has been recorded in far north and south-east Queensland (Hnatiuk 1990), but is believed to exist only as very isolated infestations. The plant has been recorded growing amongst riparian vegetation along the banks of the Brisbane River at Sherwood (Brisbane). A cultivated specimen exists at the Alan Fletcher Research Station in Brisbane. There is no information available regarding the plant's importation into Australia.

Potential Impact

P aculeata may become an invasive weed in coastal, sub-tropical areas of southern Queensland and north-eastern New South Wales. The plant has a tendency to form large, impenetrable clumps. Its extreme thorniness could make control of large infestations difficult. Since *P aculeata* has only been recorded from a few isolated locations and is not known to be widely naturalised. Eradication may be feasible.

Mimosaceae

***Pithecellobium dulce* (Roxb.) Benth.**

Syn. *Mimosa dulcis* Roxb.

**Madras thorn,
Manilla tamarind**

Summary

Pithecellobium dulce is a large tree which has become an invasive weed in Hawaii, Florida and India. At present, the plant is restricted to a single botanic garden in Australia and has not yet naturalised. There is an opportunity to remove existing specimens and prevent naturalisation. *P dulce* tolerates a range of climatic and edaphic conditions and, if permitted to spread, could become an invasive weed in sub-tropical and tropical regions of Australia.

Description

P dulce is a large, evergreen tree reaching 20m or more in height. When fully grown it can have a crown 30m in diameter. Under favourable conditions, the plant can reach a height of 10m in 5-6 years (NAS 1980). Most specimens have a pair of short, sharp spines at the base of each leaf. *PP dulce* usually reproduces from seed or from cuttings but root suckers can be produced following damage to the parent tree. Seeds do not require any treatment to germinate. *P dulce* has been cultivated as a garden ornamental, fodder and shade tree. It has been abandoned as a street tree in Florida due to its thorns and toxic sap which can cause severe eye irritation and lasting welts on people's skin. Mechanical removal can be difficult since injury to the roots triggers the production of very thorny suckers.

The plant prefers tropical and sub-tropical climates in areas where rainfall is between 450 and 1650mm per annum. It can grow from sea level up to an altitude of some 1800m (NAS 1980). It is drought resistant and develops an extensive root system under dry conditions. *PP dulce* grows on most soil types, including *clay*, oolitic limestone and sands, including wet sands that have a brackish water table (NAS 1980).

Weed Status

Holm *et al.* (1979) listed *P dulce* as a weed in Hawaii, where it smothers pasture plants. Once established, it can dominate an area. NAS (1980) commented that the plant "readily outgrows competition" and that once introduced "it may hold an area firmly". In some parts of India, repeated attempts to replace the plant with more desirable vegetation have failed (NAS 1980).

Distribution

PP *dulce is* native to a large region of America extending from southern California, through Mexico and central America into Columbia and Venezuela. It has been planted as an ornamental and has escaped cultivation in many countries including India, the Philippines, the Sudan, Tanzania, Florida, Cuba, Jamaica, Puerto Rico, Taiwan and St. Croix (NAS 1980).

In Australia, *P dulce is* believed to exist only as an individual specimen in the Townsville botanic gardens in Queensland as no naturalised specimens have been recorded (Hnatiuk 1990).

Potential Impact

PP *dulce is* considered to have significant pest potential in Australia due to its rapid growth and tolerance of a broad range of edaphic and climatic conditions. Since it is known to persist in areas where annual rainfall ranges from 450-1650mm, it appears capable of surviving over much of northern Australia. There is insufficient information in the literature to predict which vegetation types are at risk. As a precaution, restrictions should be put in place to ensure additional specimens are not imported or sold for ornamental, fodder, shade or timber

purposes.

Anacardiaceae

***Rhus radicans* L.**

Syn. *Toxicodendron radicans* (L.) Kuntze, *Toxicodendron negundo* Greene **poison ivy**

Summary

Rhus radicans is an aggressive plant that usually spreads primarily from suckers. Control can be difficult due to the caustic properties of all parts of the plant. *R. radicans* could become a dangerous weed of bushland and gardens in a range of climates but is best suited to the temperate humid zone of southern Australia. At present, it is not known to have naturalised in Australia and appears confined to a small number of gardens, including the Adelaide Botanical Gardens. Eradication appears feasible.

Description

There is some confusion in the literature regarding the taxonomy of *R. radicans* and *T radicans*. For the purposes of this study, *R. radicans is* considered to be a creeping vine whereas *T radicans is* considered to be a deciduous shrub or small tree (the authors question whether in fact the two species should be treated as synonyms). *R. radicans* has several growth forms; it can be a small perennial, deciduous, woody shrub, a trailing spreading shrub or climbing vine, reproducing from seeds but mostly from creeping root stocks. The alternate leaves are compound with three leaflets (Lorenzi and Jefferey undated). The flowers are small, inconspicuous, yellowish-green clusters that are produced in the lower leaf axils. All parts of

the plant contain a caustic, phenolic substance which causes irritation, inflammation and blisters on the skin of most people (Anon. 1971).

Weed Status

R. radicans is listed as a common weed in Canada and the USA (Holm *et al.* 1979) and is declared noxious in South Australia.

Distribution

It is native to the United States with a range extending into southern Canada and south into Mexico and the West Indies (Anon 1971). In the United States it is most abundant in moist forest situations but also occurs in pastures, fence rows, roadsides and waste places. In Australia, it has been recorded from gardens in Warwick and Stanthorpe (Queensland Herbarium). Specimens are also held by the National Herbarium of Victoria. The plant is being grown in the Botanical Gardens in South Australia in a 'toxic plant collection' (T. Christianson *pers. comm.*). In 1991, there were no reports of naturalised specimens in Australia (Csurhes 1991).

Potential Impact

Staff from the Adelaide Botanical Gardens report that the plant is aggressive within the confines of the collection, with rooting occurring from nodes into gravel substrate. Under cultivation, the plant requires regular pruning to restrict its growth (T. Christianson *pers. comm.*). It appears well suited to the climate experienced in Adelaide and can be expected to survive in the humid temperate zone of southern Australia (includes areas in New South Wales, ACT, Victoria, Tasmania and south-west Western Australia). The plant appears to prefer moist conditions and is not expected to pose a threat in areas outside temperate, wet sclerophyll forests and perhaps the edges of temperate rainforest. Once established, the plant may compete with native ground cover plants and shrubs. If *R. radicans* becomes naturalised in bushland, recreational activities such as bush walking may suffer. Eradication is feasible and highly desirable.

Lythraceae

***Rotala rotundifolia* Koehne**

Summary

Rotala rotundifolia is an aquatic plant that has escaped from water gardens to become naturalised in several areas in Queensland and New South Wales. Its potential as an environmental weed is difficult to assess since there is very limited information available on the plant's biological attributes. The plant could naturalise in wetlands, perhaps at the expense of native aquatic and semi-aquatic plants. Based on the plant's overseas distribution, tropical and sub-tropical regions of Australia may be suitable for growth. The plant is widely used by aquarists and sold through the pet industry.

Description

A perennial herb with slender prostrate rhizome and erect, glabrous stems 10-20 cm long. The small, solitary flowers are borne in the axils of the small leaves. Leaves are sessile, elliptic and opposite on the stem. The plant inhabits wetland areas, low-lying fields and moist soil adjacent to ponds and dams. It is widely used by aquarists in Australia and the United States. It is cultivated in outdoor ornamental ponds in tropical regions. Under cultivation, the plant's growth can be controlled by varying the water level in the pond (Birkill *pers. comm.*)

Weed Status

Holm *et al.* (1979) listed *R. rotundifolia* as a 'principal' weed of Thailand.

Distribution

R. rotundifolia is native to southern and south-east Asia, ranging from India to Japan. The first record of the plant in Australia was a specimen collected in Queensland in 1974 (from the Cook region of north Queensland). The latter specimen was under cultivation. Over the past ten years, naturalised specimens have been collected from several sites around Brisbane, including a tributary of the Brisbane River (Queensland Herbarium). Collections have also been made from a dam in Berkshire Park in New South Wales in 1992 and from a stand of *Melaleuca linariifolia* in an open eucalyptus forest in western Sydney. The plant is widely available through the retail aquarium trade in Queensland (Birkill *pers. comm.*) and presumably in other States.

Potential Impact

There is very limited information on the plant's biological attributes. As such, *it* is difficult to assess its weed potential. The plant may become naturalised in wetlands, perhaps at the expense of native aquatic and semi-aquatic plants. Based on the plant's overseas distribution, tropical and sub-tropical regions of Australia could be suitable for growth.

Fabaceae

***Sesbania punicea* (Cav.) Benth**

Syn. Daubentonia punicea (Cav.) DC

**red sesbania,
coffee weed**

Summary

Sesbania punicea is a South American shrub that has invaded wetlands and riparian vegetation in South Africa and the United States. In both countries, the plant was originally cultivated as a garden ornamental. *Sa punicea* has the potential to invade native vegetation in sub-tropical, humid zone (coastal regions) of eastern Australia and was recently detected being offered for sale by a nursery in Queensland. Further sale of this plant should be prevented and any garden specimens removed.

Description

S. punicea is a deciduous, leguminous shrub that grows up to 4m tall (Stirton 1978). In spring or early summer, it produces a profusion of attractive red or orange flowers. The ribbed seed pod is 6 - 8cm long and may contain 4 - 10 seeds. The seeds, flowers and leaves are toxic and have been known to kill herbivorous mammals and birds.

Weed status

In the United States, *S. punicea* was introduced as a garden ornamental. It escaped cultivation and formed dense thickets along river banks, ditch banks and disturbed areas from Florida to eastern Texas (Stirton 1978). Similarly, it was planted in gardens in South Africa and soon became naturalised. Over a **period of 20** years, the plant invaded the Natal Coastal Belt, the Natal Midlands, northern Natal near Ladysmith, the Transvaal Highlands, the eastern Transvaal, and several areas of the Cape **Province** (Stirton 1978). Throughout these areas, the plant has become an invasive weed, principally on river banks and in wetlands, where it has excluded native plants (Hoffmann and Moran 1991, Harris and Hoffman 1985). The invasion and suppression of indigenous vegetation by *S. punicea* caused considerable alarm in South Africa, to the extent that the plant was declared noxious in 1979 and subject to legislative control and a biological control program.

Distribution

S. punicea is native to South America and occurs naturally in Argentina, Uruguay and southern Brazil. In Argentina, the plant is common on the islands of the lower Parana Delta, on the margins of the Rio de la Plata and on the islands of Martin Garcia (Stirton 1978). It has become a popular garden plant throughout the world.

In Australia *S. punicea* the plant appears to be restricted to gardens in Queensland. In 1995, a wholesale nursery near Brisbane was cultivating the plant for distribution to retail nurseries. The Queensland Department of Natural Resources has since organised a media release and recalled all specimens for destruction. No naturalised specimens have been found. The plant was declared noxious in Queensland in 1994 (as a category P1 potential weed).

Potential impact

Considering the climatic similarities between coastal South Africa, Florida and south-east Queensland and the plant's history of escape in the former two countries, there is a good chance that *S. punicea* will become naturalised in sub-tropical, coastal areas of Queensland, and possibly coastal New South Wales. If naturalisation occurs, the plant is expected to compete with native plants on river banks and in low-lying wetlands. The plant's toxicity to animals is cause for further concern. Biological control may represent a long-term solution, in view of past success in South Africa.

All cultivated specimens should be removed and destroyed, regardless of their location. If continued cultivation is permitted, naturalisation is highly likely. *S. punicea* should be declared noxious in every State and Territory to ensure that it is not traded as a garden plant. Sale of *S. punicea* is only prohibited in Queensland.

Myrtaceae

Syzygium jambos
(L.) Alst.

Syn. *Eugenia jambos* L.

malabar plum,
rose apple

Summary

Syzygium jambos has the potential to invade riparian vegetation and colonise the edges of rainforest in humid sub-tropical and tropical zones. It does not appear to be widely naturalised and may be susceptible to early eradication. Unfortunately, the plant is commonly sold in nurseries and there may be numerous specimens in gardens around the country.

Description

A tropical fruit tree up to 10m tall. The terminal inflorescence is showy and usually carries four whitish-green flowers on the outside of the crown. Flowering can occur two or three times per year. The fruits are whitish-green, rose scented, about 5cm long and ripen over an extended period (Donan 1985). The dry, crisp fresh fruit is used to make jellies. Fruit/seed can be produced following self-pollination (Chantaranonthai and Parnel 1994). The tree thrives under a variety of edaphic conditions and can produce fruit when only 4-5 years old (Donan 1985).

Weed Status

S. jambos is a weed in Hawaii, the United States (Holm *et al.* 1979) and on the island of La Reunion in the Indian Ocean (MacDonald *et al.* 1991).

Distribution

S. jambos is commonly cultivated in Asia. In Australia, it is grown as a fruit tree in north Queensland (Stanton *pers. comm.*) and is present in Darwin gardens (Wilson *pers. comm.*). Naturalised specimens have not been recorded in the Northern Territory (Cowie *pers. comm.*). In Queensland, it is widely available through the nursery trade (Lawson 1996) and has naturalised at isolated locations in coastal, south-east Queensland (Queensland Herbarium).

Potential Impact

On the island of La Reunion in the Indian Ocean, *S. jambos* is considered to be the most ecologically important weed in the riverine areas of semi-dry riparian forest, where it has formed dense, tall, almost monospecific stands in the absence of human disturbance (MacDonald *et al.* 1991). The plant is capable of invading undisturbed ecosystems and reducing their conservation values (Smith 1985, in MacDonald *et al.* 1991). It readily invades disturbed rainforest and has large seeds that could probably be dispersed only by cassowaries (Stanton, *pers. comm.*). It can be difficult to eradicate using herbicides (Wilson *pers. comm.*). In Australia, the plant has the potential to invade riparian vegetation and rainforests in humid, tropical and sub-tropical areas. It appears susceptible to eradication

The plant has the potential to become established throughout lowland rainforest in the world heritage listed 'wet tropics' region of north Queensland, particularly along river/creek banks, along the edges of rainforest and within small rainforest remnants. The plant is less aggressive in south-east **Queensland but might become** a significant problem in the long term (primarily in small remnants **of lowland**, sub-tropical rainforest). It is difficult to predict whether *T grandiflora* will become a problem in rainforest remnants in north-east New South Wales, although several small infestations have been reported. Smith (1995) considers that the plant has the potential to invade monsoon vine thickets in the Northern Territory.

The plant's large tubers make chemical control difficult. Effective foliar herbicides are available. Many small infestations have been sprayed with registered herbicides and follow-up control of seedlings and regrowth is on-going. Mulgrave Shire Council have been particularly active in detecting and treating infestations. The plant's ability to set viable seed is problematic, especially when it grows along the banks of watercourses, since the seeds and root fragments are readily dispersed by flowing water.

The sale and cultivation of *TT grandiflora* as a garden ornamental poses an obstacle to eradication and existing legislative controls need to be enforced. Although the plant has been prohibited from sale in Queensland, it is legally cultivated in adjoining States.

Although eradication may be feasible, a suitable program could cost several millions of dollars to implement. In view of the plant's potential environmental impact such expenditure may be justified.

Rhamnaceae

Zizipus mucronata
Willd.

buffalo thorn,
shiny leaf, cape thorn

Summary

In Australia, *Zizipus mucronata* only exists in the Royal Botanic Gardens in Melbourne. Its history as a weed is not well documented but competition with native riparian vegetation, displacement of grasses and the obstruction of access are characteristics of this species.

Description

A thorny, perennial deciduous tree. High temperatures are required to stimulate seed germination (Zietsman and Botha 1987). Germination is inhibited by the pericarp but this enables seeds to resist prolonged water stress and survive long periods of soaking. The flowers are pollinated by insects but specialised pollinator-plant relationships do not appear to exist (Zietsman 1990). As such, the plant may be capable of producing viable seeds outside its natural range. Some plants have been recorded as primarily pollen donors and therefore act functionally as males (Zietsman *et al.* 1989).

Weed Status

Z. mucronata is recorded as a principal weed of Zimbabwe (Holm *et al.* 1979). Wells *et al.* (1986) recorded it as a pastoral weed of South Africa.

Distribution

Z. mucronata is native to southern Africa (Wells *et al.* 1986), where it often occurs along rivers, drainage lines and flood plains (Zietsman and Botha 1987). There is only one specimen known in Australia; in the Royal Botanic Gardens, Melbourne (Clarke *pers. comm.*).

Potential Impact

The plant has the potential to naturalise in sub-tropical areas of Australia, particularly along the banks of watercourses where it may compete with riparian vegetation.

5.0 DISCUSSION

The sixty three respondents nominated 294 potential environmental weed species and genera (Table 1). Fifteen species are considered to be native to Australia (Appendix A). Of the 277 non-indigenous species and genera, approximately 94% are terrestrial, 6% are aquatic or semi-aquatic, 47% are woody trees or shrubs, 31 % are non-woody dicotyledonous perennials or annuals, 11 % are monocotyledonous species (grasses, sedges etc) and 11 % are vines.

At least 73% of the species listed in Table 1 are used as ornamentals, either in gardens or in home aquaria and ponds. The trade in ornamental plants appears to be the major source of additional environmental weed species in Australia.

It is difficult to predict which species in Table 1 represent substantial threats to native ecosystems as opposed to species that may remain restricted to habitats that have been heavily disturbed by man's activities (eg. forest edges, roadsides, small "remnant" areas of bushland surrounded by urban development, and, in the case of waterweeds, polluted waterways). The difficulties associated with prioritising potential weeds and predicting weediness are discussed in Sections 2.2.2, 2.6 and 3.2.

Approximately 50% of the non-native species listed in Table 1 have histories as weeds elsewhere in the world and eradication may be feasible for 30 of these species (Table 2).

The level of funding required to eradicate species in Table 2 will vary considerably between species. For example, funding required to eradicate naturalised species will far exceed the cost of removing species restricted to gardens. The availability of funding will limit the number of eradication programs attempted. In States where funding for eradication programs is very limited, it is recommended that action be taken to remove individual garden specimens of potential weed species that have not yet become naturalised, rather than attempting eradication of naturalised species.

The probability of successful eradication is highest for species that occur only in a small number of gardens and lowest for naturalised species. Eradication of naturalised species could cost hundreds of thousands of dollars. Although some people may argue that such costs are prohibitive, eradication costs are likely to be small in comparison to the costs of future containment programs or biological control research that may be initiated on these species.

Accepting the difficulties associated with predicting pest potential and assessing the feasibility of eradication, it is recommended that pest management and conservation agencies give consideration to eradication, or at least containment, of the species listed in Table 2. The probability of these plants becoming serious pests is considered sufficient to justify expenditure on preventative control.

Of concern is the current absence of restrictions over the cultivation and sale of most species highlighted by this study and the ease with which additional plant species with unknown pest potential can be imported and sold. Currently, 37% of the plant species listed in Table 2 have been declared noxious in one or more States/Territories, however, no species have been declared in every State and Territory (Table 3). Several species listed in Table 2 have been cultivated as garden ornamentals in other countries prior to naturalisation in those countries and a similar sequence of events will probably occur in Australia. At least one species is available through Australian "mail-order" seed catalogues.

There are currently no national controls over the sale of ornamental plants. Species prohibited from sale in one or two States can be freely sold as ornamental plants in neighbouring States. This situation needs to be addressed by State and Commonwealth pest management agencies, particularly since the National Weeds Strategy has recommended increases attention to preventative weed management.

Table 3. Number of potential environmental weed species and general listed in Table 2 that are declared "noxious" (subject to legislative restrictions on sale or cultivation) in States and Territories of Australia (as of January 1997).

State/Territory	Number of species/genera listed in Table 2 currently subject to restrictions on cultivation and/or sale
Western Australia	
South Australia	
Victoria	
Tasmania	
New South Wales	
ACT	

Considering the large number of potential weed species in Australia, it is clear that improved legislation is required to reduce the rate at which additional pest plant species are being imported into the country. Ideally, consideration should be given to legislation that lists "approved" (non-weedy) exotic plants that can be sold as ornamentals, rather than listing "prohibited" (weedy or potentially weedy) species. In this manner, any non-native species not listed as "approved" species are automatically prohibited as garden/aquarium ornamentals. This approach could restrict the continued importation of ornamental plant species that have unknown pest potential. In addition, early detection and eradication protocols, applied by State/Territory Governments, should form a 'second line of defence' for species that pass through quarantine barriers.

The results of this study can be used to assist State and Territory agencies to develop a proactive approach to pest management and to help justify the allocation of funding resources to early detection and eradication of potential weeds. Hopefully, recommendations for preventative control will not go unheeded, as did the warning of Mr PR. Gordon, Chief Inspector of Stock, in 1890, who wrote;

"In my report for 1880, I directed special attention to the introduction of a new and very destructive plant, the Noogoora burr. Had my recommendations been adopted at the time 100 pounds would have exterminated this pest. It has now spread to such an extent that, like Bathurst burr, its complete extermination is a matter of extreme improbability. "

6.0 RECOMMENDATIONS

Pest management agencies should develop programs for eradication, or at least containment, of potential weed species listed in Table 2. Priority should be given to species restricted to gardens.

Existing National and State restrictions on the importation, cultivation and sale of non-native plant species for use in gardens and aquaria need to be improved.

A greater proportion of funds currently being expended on the containment of widespread weed species should be redirected to the eradication of plant species considered to be in their very early stages of naturalisation (emphasis on 'prevention' rather than 'cure').

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8.0 LIST OF CONTRIBUTORS

Queensland

T. Bean

Queensland Herbarium, Department of Environment, Brisbane

Peter Bostock

Queensland Herbarium, Department of Environment, Brisbane

Margaret Brennan

Environment Branch, Brisbane City Council

Anne-marie Burkill

General Manager, Pisces Enterprises, Spokesperson for Pet Industry Joint Advisory Council (PIJAC) on aquatic plants, Brisbane

Philip Cameron

Botanic Gardens, Mt Coot-tha, Brisbane City Council

Laurie Capill

Project Officer, Forest Industry Development, Department of Primary Industries, Brisbane

John Clarkeson

Principal Botanist, Department of Environment, Mareeba

Jim Curnow

Pasture Agronomist, Department of Primary Industries, Mareeba

Bruce Dunstan

Secretary, International *Heliconia* Society, Morayfield

Gio Fichera

Biological Control Unit, CSIRO, Brisbane

Rebecca Francis

Queensland Herbarium, Department of Environment, Brisbane

Gordon Geymer

Queensland Herbarium, Department of Environment, Brisbane

Andrew Grodecki

Development Extension Officer - Tree Care, Department of Primary Industries, Brisbane

Mick Julian

Officer in Charge, CSIRO, Brisbane

Trevor Stanley

Professional Leader, Department of Natural Resources, Charters Towers

Peter Stanton

Department of Environment, Cairns

Nigel Tucker

Lake Eacham Nursery, Department of Environment, Yungaburra

Peter van Haaren

District Experimentalist (Wet Tropics), Department of Natural Resources, Charters Towers

Barbara Waterhouse

Quarantine Botanist, Mareeaba

David Wilmington

Curator, Flecker Botanical Gardens, Cairns

New South Wales

T.C. Chambers

Director, National Herbarium, Royal Botanic Gardens, Sydney

John Fisher

Program Leader (Weeds), Department of Agriculture, Orange

John Hoskings

Centre for Crop Improvement, New South Wales Agriculture, Tamworth

Andrew Leys

Co-ordinator Pest Management, National Parks and Wildlife

Terri MacDonald

Australian Association of Bush Regenerators, Epping

Seanna McCune

National Herbarium, Royal Botanic Gardens, Sydney

Judy Rawlings

Urban Bushland Management, Castle Hill

Australian Capital Territory

Katherine Colgan

Assistant Director, Invasive Species Section, Biodiversity Group, Environment Australia, Canberra

John Phillip

Executive Director, Australian Institute of Landscape Architects, Canberra

Sam Storey

Greening Australia, Canberra

Victoria

Michelle Arundel

Arthur Rylah Institute, Department of Natural Resources and Environment, Heidelberg

Kate Blood

Flora Planner, Environmental Weeds, Department of Natural Resources and Environment, Melbourne

Tim Bloomfield

Environmental Officer, Nillumbik Shire Council

Ian Clarke

National Herbarium, Royal Botanic Gardens, Melbourne

Roger Spencer

National Herbarium, Royal Botanic Gardens, Melbourne

Fiona Young

Arthur Rylah Institute, Department of Natural Resources and Environment, Heidelberg

South Australia

Richard Carter

Animal and Plant Pest Control Commission, Adelaide

T. Christianson

Botanic Gardens Adelaide and State Herbarium, Adelaide

David Cooke

Botanist, Animal and Plant Control Commission, Adelaide

John Jessop

Chief Botanist, Botanic Gardens Adelaide and State Herbarium, Adelaide

Peter Lehmann Greening

Australia, Adelaide

Carmel Schmidt Consultant,

AACM, Adelaide

Tasmania

Alex Buchanan

Tasmanian Herbarium, Tasmanian Museum and Art Gallery, Hobart

Jenny Murray

Data Extracts, Tasmanian Herbarium, Tasmanian Museum and Art Gallery, Hobart

Andrew Rozefelds

Curator, Tasmanian Herbarium, Tasmanian Museum and Art Gallery, Hobart

Western Australia

John Dodd

Research Officer, Agriculture Western Australia, Perth

Malcolm Graham

Senior Operations Officer, Department of Conservation and Land Management, Katanning

Penny Hussey

Conservation and Land Management, Como

Greg Keighery

Conservation and Land Management, Perth

Andrew Mitchell

Agriculture Western Australia, Perth

Patrick Piggot

Western Australian Herbarium, Department of Conservation and Land Management, Bentley

Kim Robinson

Katanning

Leigh Sage

Western Australian Herbarium, Department of Conservation and Land Management, Bentley

Neil Waterhouse

Eastern Hills Plant Farm, Sawyer Valley

Northern Territory

David Albrecht

Conservation Commission of the Northern Territory, Alice Springs

Ian Cowie

Botanist, Parks and Wildlife Commission of the Northern Territory, Darwin

Rick Dance

Weeds Officer, Department of Primary Industries and Fisheries, Alice Springs

Clyde Dunlop

Parks and Wildlife Commission of the Northern Territory, Palmerston

Margaret Friedel

Arid Zone Research Institute, CSIRO, Alice Springs

Ian Miller

Principal Agronomist, Department of Primary Industries and Fisheries, Berrimah

Colin Wilson

Parks and Wildlife Commission of the Northern Territory, Palmerston

Overseas

Mark Lonsdale

CSIRO Division of Entomology, European Laboratory, Montferrier sur Lez, France

R. MacFarlane

South Pacific Commission Plant Protection Service, Fiji

APPENDIX A

List of native species removed from Table 1.

SPECIES	FAMILY
<i>Acacia podalyrifolia</i> G. Don	Mimosaceae
<i>Acacia saligna</i> (Labill.) H.L. Wendl	Mimosaceae
<i>Albizia lophantha</i> (Willd.) Benth. (Syn. <i>A. distichya</i> , <i>A. montana</i> , <i>Paraserianthes lophantha</i>).	Mimosaceae
<i>Alectryon tomentosa</i> (F Muell) Radlk.	Sapindaceae
<i>Alternanthera denticulata</i> R.Br.	Amaranthaceae
<i>Annona squamosa</i> L.	Annonaceae
<i>Bauhinia monandra</i> Kurz.	Caesalpiniaceae
<i>Curculigo capitulata</i> (Lour.) Kuntze (Syn. <i>Molineria capitulata</i>)	Liliaceae
<i>Eleocharis parodii</i> Barros	Cyperaceae
<i>Eucalyptus cladocalyx</i> E Muell.	Myrtaceae
<i>Euphorbia paralias</i> L.	Euphorbiaceae
<i>Melaleuca</i> spp. (eastern State species naturalised in WA).	Myrtaceae
<i>Ruellia tuberosa</i> L.	Acanthaceae
<i>Sesbania cannabina</i> (Retz.) Pers. (Syn. <i>S. aculeata</i> Poir, <i>S. bispinosa</i> Steud. ex Wight)	Fabaceae
<i>Tecomaria capensis</i> (Thunb.) Spach.	Bignoniaceae

Achillea distans
Willd.

tansy leaf milfoil

Family: Asteraceae

Achillea distans is an erect woolly herb to c. 120 cm (Harden 1992). The leaves are lanceolate with pinnatisect margins. Stems are winged. The daisy-like flower has whitish, pink or red petals with yellow disc florets (Harden 1992). Native to Europe and introduced as an ornamental, *A. distans* has naturalised in south-east Queensland, New South Wales, Tasmania (Hnatiuk 1990) and the Northern Territory (Harden 1992). In the ACT, the plant has a restricted distribution and is considered to have 'moderate to high weed potential' (Berry and Mulvaney 1995). Several related species have histories as weeds elsewhere in the world (Holm *et al.* 1979).

Allamanda
***cathartica* L.**

yellow trumpet vine

Family: Apocynaceae

Allamanda cathartica is a scrambling plant which may form a shrub-like clump or climb into nearby vegetation (clumps are usually 2m tall and 2-3m wide). It produces large, yellow flowers and has been widely cultivated in gardens for at least the past 30 years. Several cultivars have been developed for gardens (depending on the cultivar, flower colour ranges from pink to yellow). Bodkin (1986) stated that the plant "prefers rich, well composted, moist, well drained soils in a sunny position" and can be propagated from cuttings. The plant is native to Guyana (South America) (Bodkin 1986). Stanton (*pers. comm.*) reports that *A. cathartica* has become quite invasive in several National Parks of far north Queensland. It is becoming common along roadsides between Silkwood and Tully (north Qld). *A. cathartica* can be difficult to control using foliar applied herbicides because of its scrambling habit. Humphries and Stanton (1992) listed *A. cathartica* as a weed of roadsides in the 'wet tropics' region of north Queensland, but did not consider the plant to be a high priority environmental weed.

***Alnus glutinosa* (**
L.) Gaertn.

alder

Family: Betulaceae

Alnus glutinosa is a tree 20-40m tall. It is native to north-west Europe, western Asia and north Africa (Bodkin 1986) and has been cultivated as an ornamental in Australia. The plant's winged seeds are dispersed by wind or water (Swarbrick and Skarratt 1994). In gardens, the plant prefers moist, medium to heavy soils and a protected, shady position (Bodkin 1986). Berry and Mulvaney (1995) listed *A. glutinosa* as a species considered to have 'moderate to high weed potential' and a restricted distribution (on lake shores) in the ACT. Four related species have also naturalised in Australia (Hnatiuk 1990).

Aloe cameroni
Hemsley

Family: Aloeaceae

Aloe cameroni is a low, spreading fleshy shrub native to Africa. It produces spikes of orange flowers. Unlike most naturalised Aloes, this species produces copious quantities of seeds. The species is arborescent, the leaves are spotted and the inflorescence branched. There is only one naturalised population at a garden refuse site at Ipswich (Forster *pers. comm.*). It is grown by collectors but is not in the general nursery trade.

Anredera cordifolia
(Tenore) Steenis.

**Madeira vine, lamb's
tails**

Family: Basellaceae

A succulent vine to c. **8m** tall. Slender twining stems support heart-shaped leaves. The inflorescence is a cluster (c. 30 cm long) of small, white flowers. It reproduces from axillary tubers that break off and are dispersed by water. It is native to South America and is cultivated as an ornamental (Swarbrick and Skarratt 1994). Naturalised in all States, except South Australia and the Northern Territory (Swarbrick and Skarratt 1994). In Western Australia, it has naturalised around urban lakes but in Queensland and New South Wales it is a weed of riparian vegetation, the edges of rainforest, tall open forest and damp sclerophyll forests (Swarbrick and Skarratt 1994). It is rare in Victoria and Tasmania. In Victoria, *A. cordifolia* is considered a serious threat to roc outcrop vegetation (Carr *et al.* 1992).

Arbutus unedo

strawberry tree

Family: Ericaceae

Arbutus unedo is a small (up to c. 5m tall) tree, native to southern Europe. Introduced and planted in Australia as a garden ornamental and for its edible fruit. White flowers in terminal racemes followed by red berries resembling strawberries. The fruit/seeds are spread by birds (Carr *et al.* 1992). When grown in gardens, the plant prefers 'light, acid soils in a sunny, protected position' (Bodkin 1986). *A. unedo* has naturalised in Australia and exists as isolated, small populations in dry, moist and wet sclerophyll forest in Victoria (Carr *et al.* 1992). It is currently sold by nurseries.

Ardisia crenata

coral berry

Family: Myrsinaceae

Ardisia crenata is a small, branching shrub (to 1m) with fragrant, white or deep pink flowers followed by bright red berries that remain on the tree for several months. Several cultivars have been developed for use as garden ornamentals (eg. cv. 'alba' produces white berries and cv. 'pink pearls' produces bright pink berries). *A. crenata* prefers rich, well-drained soils in a partially shaded position and can be propagated from seed or cuttings (Bodkin 1986). The plant occurs naturally- from north-east India to Japan (Swarbrick and Skarratt 1994). *A. crenata* has naturalised in remnant rainforest in north-east New South Wales (Dunphy 1988) and is probably being spread by birds which feed on the plant's berries. It may have the potential to become an environmental weed in Queensland (Stanley, *pers. comm.*).

***Ardisia crispa* (Thunb.) DC.**

coral ardisia

Family: Myrsinaceae

An evergreen shrub (to 1m), native to China. It prefers light, well drained soils in a semi-shaded position (Bodkin 1986) and produces pink, fragrant flowers and red berries. It has the potential to be spread by birds into native vegetation (much like *A. crenata*), possibly in subtropical and temperate areas. A variegated form (cv. *variegata*) has been developed by the nursery trade.

Aristea ecklonii

aristea

Family: Iridaceae

Aristea ecklonii is a perennial herb to about 70 cm that is native to western and southern Africa (Harden 1993). Leaves are linear and leathery. Bright blue flowers in loose panicle. Numerous small seeds dispersed by water (Carr *et al.* 1992). Isolated, small naturalised populations exist in Victoria, where it is considered to pose a threat to riparian vegetation and dry sclerophyll forest/woodland (Carr *et al.* 1992). Small naturalised populations exist on the central coast of New South Wales in disturbed woodland (Hosking, *pers. comm.*) and the Sydney area (Harden 1993).

Aristolochia elegans
Masters

Syn. *A. littoralis*

Dutchman's pipe

Family: Aristolochiaceae

Aristolochia elegans is a rapidly growing vine which can be cultivated by seed or from cuttings. It prefers fertile, moist soils and can grow to 3m. The flowers are reddish purple (marked with white and yellow) and are shaped like a traditional Dutchman's pipe. *A. elegans* has naturalised in north eastern New South Wales (Dunphy 1988) and in Queensland, primarily in high rainfall, coastal areas including the Conondale Ranges, Coomera River catchment, Mary River, around Cairns and in many State forests (Scott, *pers. comm.*). Unfortunately, the plant has been widely grown as an ornamental and is still being promoted as an 'attractive garden plant' in most gardening books. The origin of the plant is uncertain but it is believed to be native to Brazil (Hall and Brown 1993). It is now present in the Caribbean and south eastern USA.

A similar plant, *Aristolochia praevanosa*, is native to lowland rainforests of northern New South Wales and southern Queensland and is the food-plant of the endangered Richmond birdwing butterfly (*Ornithoptera richmondia*). Female birdwings lay their eggs on the introduced *A. elegans* but the larvae are unable to feed and perish. Other species of butterfly larvae also perish on *A. elegans*, including the big greasy (*Cressida cressida*) and the red-bodied swallowtail (*Pachlopta polydorus*).

A. elegans can be controlled by either mechanical or chemical means and was eradicated from Burleigh Heads National Park in Queensland (Scott, *pers. comm.*). Community groups are trying to eradicate this plant from several other locations in Queensland.

Asparagus
***africanus* Lam.**

Syn. *A. cooper* %:
Protasparagus africanus
(Lam.) Oberm.

asparagus fern

Family: Liliaceae

Asparagus africanus is a sub-shrub or climber with stems 8-12m high (Harden 1993). It produces bird-dispersed, orange berries that each contain one seed. Cultivated as a garden ornamental and occasionally dumped into bushland. Florists use the leaves in floral arrangements (Ellison 1995). Native to South Africa it has naturalised in coastal districts north of Lismore, New South Wales (Harden 1993) and in south-east Queensland (Burnett, Wide Bay and Moreton regions) (Hnatiuk 1990). It has the potential to invade rainforests, vine scrubs and riparian vegetation throughout coastal, sub-tropical areas of eastern Australia. Restrictions on importation of related species have been suggested by Bowden and Rogers (1996).

***Barleria* spp. (BM
cristata and *B.
lupulina*)**

barleria

Family: Acanthaceae

The *Barleria* genus is comprised of shrubby and herbaceous species native to tropical and mild temperate areas (Ellison 1995). They reproduce by seeds or soft wood cuttings. At least three species are currently sold as garden ornamentals. *B. cristata* ('Philippine violet') and *B. lupulina* are small, bushy shrubs growing to c. 1 m tall. *B. cristata* is native to India (Bodkin 1986). *B. lupulina* has small thorns and produces erect, yellow flower heads. It is widely sold by nurseries and has escaped from gardens. The plants appears to favour riparian vegetation. (note: *Barleria prionitis* L. is listed in Table 3)

***Basella alba* L.**

Family: Basellaceae

Basella alba is a perennial herb native to Africa and South East Asia (Groves 1996). Slender twining stems from tuber-bearing rhizomes (Harden 1990). First listed as naturalised in the New South Wales Herbarium Annual Report, 1989-90, and by Harden (1993). The plant is believed to be restricted to small areas.

***Berberis darwinii*
Hook.**

barberry

Family: Berberidaceae

Berberis darwinii is a shrub to c. 2m tall, native to south America (Chile). It has deep green leaves which are prickly, holly-like and 2.5 cm long. The flowers are deep yellow and occur in clusters, 7.5cm across. The fruit are small, blue-black berries that can be dispersed by birds (Carr *et al.* 1992, Swarbrick and Skarratt 1994). Propagated from seeds or by cuttings. It is not a common garden plant but isolated naturalised specimens exist in wet sclerophyll forests in the Dandenong Ranges, Victoria (Robinson, *pers. comm.*). It is considered to represent a potential threat to one or more vegetation formations in Victoria (Carr *et al.* 1992). The plant has a restricted distribution in the ACT, but is considered to have 'moderate to high weed potential' (Berry and Mulvaney 1995).

***Bulbostylis
striatella***
C. B. Clarke

Family: Cyperaceae

Bulbostylis striatella is a slender tufted annual or short-lived perennial native to South Africa (Harden 1993). The first record of *B. striatella* in Australia was a specimen collected in 1987 near Glen Innes (New South Wales) in grasslands on rocky hills.

***Calliandra* spp.**

Family: Mimosaceae

At least seven species of *Calliandra* are cultivated as garden ornamentals (listed by Bodkin 1986). Most are shrubs, native to tropical America, which prefer moist, well drained soils. The leaves are generally either pinnate or bipinnate and reproduction is via seed. Perhaps one of the most common species is *C. haematocephala* ("red powder puff"), an open-crowned, leguminous shrub. It often produces seedlings in gardens. It is native to Central America and has been planted around the world for ornament. NAS (1980) commented that *Calliandra calothyrsus* Meissn. is "so hardy and reproduces so easily that it may become a weed of sorts and may be difficult to keep in check".

***Callisia fragrans* (Lindley) Woodson**

fragrant inch plant

Family: Commelinaceae

Callisia fragrans is native of tropical America and prefers fertile, moist soils in a protected, partially shaded area (Bodkin 1986). It grows to 0.25m with a spread of 1m. The stems are fleshy, creeping or trailing and sparsely branched. The leaves are 25cm long and 5cm wide and become reddish in strong sunlight. Flowers are white and fragrant (Bodkin 1986). Propagation is via seed or cuttings. It has naturalised in south-east Queensland (Hnatiuk 1990).

Camellia sinensis
(L.) Kuntze.

tea

Family: Theaceae

Camellia sinensis is a small tree/shrub (to c. 15m tall) native to China and India (Bodkin 1986). Propagation occurs from cuttings (Bodkin 1986). Naturalised specimens have been recorded in far north Queensland (eg. Bingle Bay near Mission Beach) and south-east Queensland (Hnatiuk 1990), possibly following abandonment of plantations. It appears to colonise gaps and is not an aggressive invader of relatively undisturbed habitats.

Caryota mitis

fishtail palm

Family: Arecaceae

Caryota mitis grows to 5m tall and is native to Burma and Malaysia (Bodkin 1986). The stems are numerous and clumping. The leaves are bipinnate and 2m long, with segments that have a fishtail-like appearance. Propagation is from seed (Bodkin 1986). The plant appears to have weed potential in northern Australia (Dunlop, *pers. comm.*).

Cassia siamea

cassod tree

Family: Caesalpiaceae

Cassia siamea is an erect tree which grows to a height of some 10m. It is native to India, Sri Lanka and Malaysia and prefers fertile, moist soils (Bodkin 1986). The leaves are dark green, pinnate and approximately 30cm long. Flowers are yellow and arranged in racemes 45cm long. Fruit are black pods, 35cm long. Propagation is from scarified seed (Bodkin 1986). The plant is showing signs of weediness in the Northern Territory (Dunlop, *pers. comm.*). In north Queensland, the plant has invaded forests near towns and is spreading along river banks on lower Cape York (Stanton, *pers. comm.*). It is believed to have escaped from the 'old Laura homestead' and is now spreading down Laura River.

Castilla elastica

**Panama rubber tree,
castilla rubber tree**

Family: Moraceae

Castilla elastica is native to tropical America (southern Mexico to northern South America). It is reported to be invading rainforest in the Kamerunga area near Cairns. Naturalised specimens may have originated from the horticultural station nearby (Stanton, *pers. comm.*). It has also been recorded from Lake Placid (near Cairns) where it is numerous in small areas of edges and clearings on red soil (Queensland Herbarium).

Cestrum elegans

Family: Solanaceae

Cestrum elegans, a shrub native to South America, grows to a height of 2m and produces purplish-red, tubular flowers arranged in loose, terminal clusters (Bodkin 1986). It is invasive in moist and wet sclerophyll forests in Victoria (Carr 1992, Swarbrick and Skarratt 1994). The plant reproduces from seeds and cuttings (Bodkin 1986).

***Chasmanthe
aethiopica*
(L.) N. E. Brown**

*Syn. Chasmanthe
floribunda* (Salisb.)
N.E. Br.

African cornflag

Family: Iridaceae

Chasmanthe floribunda is a perennial growing to c. 1m. The leaves are broadly sword-shaped. Stems are erect with orange and red tubular flowers occurring along the spike (Bodkin 1986). It is propagated by the division of corms. Carr *et al.* (1992) suggested that it is dispersed by wind and water. It is grown as a garden ornamental and prefers light to medium well-drained soils in an open sunny position. It is drought resistant but frost tender (Bodkin 1986). It is native to South Africa and is not recorded as a weed by Holm *et al.* (1979).

It has escaped from gardens in Australia and can be found in urban bushland, wasteland and roadsides in the south-west of Western Australia (Keighery 1994), around settled areas in south-east South Australia, the Sydney region, north-east Tasmania (Hnatiuk 1990) and in Victoria (Carr *et al.* 1992). Scattered naturalised populations represent a serious threat to grassy woodlands, dry and damp sclerophyll forest and riparian vegetation in Victoria (Carr *et al.* 1992). Keighery (1993) believes it is a weed of low impact in highly disturbed areas but belongs to a group of South African ornamentals that are spreading throughout south-west Western Australia.

Chukrasia velutina

Family: Meliaceae

Chukrasia velutina is a cabinet timber species related to red cedar. It can be described as a 'pioneer' species as it tends to colonise disturbed areas. It produces large quantities of wind-blown seed and was grown experimentally near Lake Tinaroo on the Atherton Tablelands (north Queensland) in the 1960's. Humphries and Stanton (1992) reported that the plant had covered about one hectare of previously cleared land. It is being grown on private properties such as in the Wongabelt on the Atherton Tablelands. Capill (*pers. comm.*) reported that it is causing localised problems in north Queensland.

Cinnamomum camphora

camphor laurel

T. Nees & C. Eberm

Family: Lauraceae

Cinnamomum camphora is a large, robust tree which grows to about 20m tall. The leaves are ovate to elliptical and emit a characteristic camphor odour when crushed. The plant produces small, white flowers arranged in axillary panicles near the ends of the branches (Firth 1986). Fruit is a small, green berry which turns black when ripe containing a single seed. A mature tree can produce some 100 000 fruit per annum. Many native frugiferous birds disperse the hard seeds. Seeds are also dispersed by water (Firth 1986). Seeds voided by birds germinate readily and remain viable for up to three years. Seedlings grow slowly under forest canopies but can grow rapidly following disturbance.

C. camphora is native to Japan, China and northern Vietnam (Harden 1990). Introduced into Australia as an ornamental tree early in the colonial period it quickly naturalised in the Sydney area (Firth 1986). It was planted for shade and shelter on dairy farms and in school yards throughout coastal New South Wales and Queensland. Now considered to be a serious weed in the north coast area of New South Wales and south-east Queensland, particularly in the Richmond-Tweed area and the Gold Coast hinterland. Extensive, monospecific stands have developed along the banks of creeks and rivers preventing regeneration of native tree and shrub species. It is particularly well-adapted to areas formerly covered by rainforest. On the Sunshine coast of south-east Queensland, *C. camphora* is considered to be the most important threat to the conservation of remnant native forests (Garraty, *pers. comm.*). It provides a food-source to a select group of bird species. *C. camphora* is competing strongly with remnant populations of *Eucalyptus tereticornis*, a preferred food tree of koalas in south-east Queensland (Csurhes 1992). Control can be extremely labour intensive and expensive.

Clematis flammula

Family: Ranunculaceae

Clematis flammula is a deciduous, woody vine to 5m tall. Native to southern Europe it prefers cool, moist, fertile soils in protected, sunny positions (Bodkin 1986). White flowers, 2.5cm in diameter, in loose clusters. Propagation is by seed or cuttings (Bodkin 1986).

Clerodendrum grandiflora

Family: Verbenaceae

Clerodendrum grandiflora is a vine with red flowers. It is an 'aggressive' plant which spreads from seed and suckers.

***Clitoria laurifolia* Poiret**

Family: Fabaceae

This perennial, legume shrub (to c. 1 m in height) is native to tropical America. The leaves are pinnate (comprised of three leaflets) and the flowers are purple to nearly white. It exists as small isolated populations in the Cardwell area of coastal, north Queensland (Hacker 1990). Humphries and Stanton (1992) report a 3ha infestation of numerous scattered thickets of mature shrubs surrounded by seedlings in the understorey of a *Melaleuca* wetland in the Kennedy National Park. Subsequent control work revealed additional infestations.

***Coffea* spp.**
**(*C. arabica* L.,
C. liberica and
C. robusta)**

coffee

Family: Rubiaceae

All three *Coffea* species have naturalised in rainforest areas of the 'wet tropics' region of north Queensland. *C. arabica* is a shrub or small tree usually some 2-3m tall but up to 5m. It is native to tropical Africa and prefers deep, fertile soils associated with rainforest areas in tropical or sub-tropical climates. The flowers are white and are followed by red drupes that each contain two seeds. *C. arabica* (which is grown commercially to produce coffee) has naturalised in rainforest fringe around Kuranda and on the Atherton Tablelands in north Queensland. Naturalised populations of *C. arabica* tend to be associated with abandoned plantations. Infestations are small but have the potential to spread. *Coffea* is a priority weed of conservation concern in the 'wet tropics' rainforest (Humphries and Stanton 1992), since it is a rainforest understorey species in its natural habitat. Eradication of naturalised populations may still be feasible but plantation specimens would serve as seed sources for re-invasion. Seeds can be transported over considerable distances by cassowaries, other birds, fruit bats and rats.

Coprosma repens
A. Rich

mirror plant, looking
glass bush

Family: Rubiaceae

Coprosma repens is a prostrate shrub/small tree growing to about 8 m tall (Harden 1992). The leaves are rounded and glossy green (Bodkin 1992). The flowers are white and arranged in terminal clusters. The plant produces orange fruit that are dispersed by birds (Swarbrick and Skarratt 1994). Propagation occurs from seeds.

C. repens is native to New Zealand (Harden 1992) and has naturalised in South Australia, New South Wales, Victoria and Tasmania. In Tasmania, it is a weed on the Furneaux Group of islands (Swarbrick and Skarratt 1994). In New South Wales, it occurs mostly along the coast, close to beaches and headlands (Harden 1992). It exists as medium to large populations in Victoria, where it has invaded numerous vegetation types ranging from dry coastal heathlands to freshwater wetlands, sclerophyll forests, rock outcrops and even warm temperate rainforest (Carr *et al.* 1992). It is particularly widespread on the Mornington Peninsular (Swarbrick and Skarratt 1994). *C. repens* is a common plant in gardens in most States of Australia and several cultivars are sold as garden ornamentals (Lawson 1997).

***Cotoneaster
horizontalis***

prostrate cotoneaster

Family: Rosaceae

Cotoneaster horizontalis is a Chinese ornamental shrub growing to approximately 1m. It is grown in chalet gardens in the Mt Buffalo National Park (alpine region of Victoria) and has escaped to nearby alpine slopes. It has a very limited distribution in the wild but continued sale in nurseries will result in further naturalisation. Vectors of spread are thought to include birds and water. The plant appears to have the potential to become an invasive weed in sub-alpine and alpine vegetation (particularly rocky slopes) (Carr *et al.* 1992).

***Crassula multicava*
Lemaire
(ssp. *multicava*)**

Family: Crassulaceae

A succulent plant native to South Africa (Swarbrick and Skarratt 1994) which has naturalised in Victoria. The numerous small populations threaten dry sclerophyll forest and woodlands, dry coastal vegetation and rock outcrop vegetation (Carr *et al.* 1992). Spread is vegetative.

***Crocosmia
crocosmiifolia*
(Nicholson)
N.E. Brown**

Montbretia

Family: Iridaceae

This species is a perennial, cormous herb with sword-shaped leaves. It is native to South Africa and was deliberately introduced into Australia as a garden ornamental. Reproduction is vegetative (dispersed by water). In Victoria, Carr *et al.* (1992) recorded the plant to be widespread, with medium to large populations, invading dry coastal vegetation, lowland grassland and grassy woodland, dry sclerophyll forest and woodland, damp/wet sclerophyll woodland and riparian vegetation. It may only have a minor impact on native plant communities, since it tends to be restricted to highly disturbed sites (Keighery 1993). Also naturalised in Queensland, New South Wales and Western Australia (Swarbrick and Skarratt 1994). It is available through the nursery industry and several other species of *Crocosmia* are cultivated as garden plants (eg. three species described by Bodkin 1986).

Cryptostegia madagascariensis

Family: Asclepiadaceae

This plant is a woody vine (up to c. 15m in height) which spreads via wind-blown seed. It is native to Madagascar and was introduced into-Australia as a garden ornamental. Small, naturalised populations exist in Western Australia in the Kimberley region, Broome and Derby (Goble-Garratt and Keighery 1992, Swarbrick and Skarratt 1994). Most naturalised specimens appear to exist in highly disturbed areas. The plant has been present in Queensland gardens for several decades but does not appear to have naturalised.

***Cupressus lusitanicus* Mill.**

Arizona cypress

Family: Cupressaceae

Cupressus lusitanicus is a North American tree (to c. 30m tall) with blue-green, waxy foliage and reddish-brown bark. The plant produces seed cones which are about 1.5cm diameter and very waxy. It is reported to have a rapid growth rate (Maro *et al.* 1991). Reproduction occurs via wind-blown seed. This tree is grown in many countries as a garden ornamental and in commercial forestry plantations throughout the tropical and temperate world, including Australia. Hnatiuk (1990) listed the plant as being naturalised in Queensland and Carr *et al.* (1992) recorded the plant as having established localised populations in riparian vegetation in Victoria. Carr *et al.* (1992) consider the plant to pose a potential threat to one or more vegetation formations in Victoria. When grown in plantations, the plant may cause significant changes to levelsof organic matter, total nitrogen, exchangeable sodium and pH of the soil (Maro *et al.* 1991). In Ethiopia, natural forest soil was found to have a higher content of total nitrogen, available phosphorus and exchangeable calcium compared to soils associated with plantations of *C. lusitanicus* (Michelsen *et al.* 1996). Michelsen *et al.* (1996) reported a much lower diversity and cover of herbaceous plants growing in plantations of *C. lusitanicus*, compared to a natural forest. The authors recommend that *C. lusitanicus* should not be planted because of the risk of soil erosion. Strusaker *et al.* (1989) in Chapman and Chapman (1996) reported significant levels of dieback in some tropical rainforest species down slope of conifer plantations and suggest that conifers should not be established in proximity to natural tropical forests.

***Cupressus
macrocarpa* Gord.**

Monterey cypress

Family: Cupressaceae

Cupressus macrocarpa is a large tree (c. 25m tall) imported from North America and planted in Australia as a garden ornamental. Reproduction is from wind-dispersed, winged seed. In Victoria, small populations in limited distribution have invaded dry coastal vegetation, lowland grassland, grassy woodland and rock outcrop vegetation (Carr *et al.* 1992). It also exists in Tasmania (Robin 1991 in Swarbrick and Skarratt 1994).

***Cyperus vorsteri*
K. L. Wilson**

Family: Cyperaceae

Cyperus vorsteri is a robust tufted perennial with short thick rhizomes (Harden 1993). A South African plant which was probably introduced into Australia quite recently, perhaps as a garden ornamental (possibly pre-1993). It has naturalised around Sydney and appears confined to disturbed woodlands in suburban parks (Harden 1993). In Western Australia it is naturalised in urban wetlands (Keighery 1994) and possibly identified as a synonym, *Mariscus grantii* C.B. Clarke (Harden 1993).

***Cytisus palmensis* (
Christ) Hutch.**

Syn. *Chamaecytisus
palmensis* or *C. proliferus* (L.
F) Link.

tree lucerne, tagasaste

Family: Fabaceae

A large shrub or tree to c. 5 m, native to the Canary Islands. Most reproduction occurs from water-dispersed seeds. Introduced for stock forage, as a hedge plant and for use as a garden ornamental it is now naturalised in Victoria, South Australia and Western Australia. In Victoria, it exists as medium to large naturalised stands in heathland and heathy woodland, lowland grassland and grassy woodland, dry sclerophyll forest/woodland, damp sclerophyll forest and riparian vegetation (Carr *et al.* 1992). Planted as a fodder crop throughout the higher rainfall regions of the Western Australian wheatbelt it is spreading along tracks and roads in the jarrah (*Eucalyptus marginata*) forests of the Darling Range, near Perth (J. Dodd, *pers. comm.*). It is available from nurseries and still promoted as a fodder plant for cattle.

Dalbergia sissoo
Roxb.

shisham

Family: Fabaceae

Dalbergia sissoo is an erect, deciduous tree (to 20m). It is native to India, where it behaves as a 'pioneer' species (Tewari *et al.* 1992). The flowers are cream, pea-shaped and arranged in small panicles. Pods up to 10cm long. It reproduces from seeds and suckers. Growth is most prolific in tropical and sub-tropical climates, particularly in areas where there is considerable soil moisture (but not waterlogged soils).

D. sissoo has naturalised in Queensland, where it exists as small, isolated populations. In Darwin, it has formed dense thickets on sand dunes near Mandorah (near Darwin harbour) and there are scattered infestations elsewhere in the city (Parsons and Cuthbertson 1992). Elsewhere in the Northern Territory, it grows mostly on sands and gravels along watercourses, sometimes spreading into drier forests and plains (Parsons and Cuthbertson 1992). It has been declared noxious in the Northern Territory.

Delonix regia
(Bojer) Rafin.

poinciana

Family: Caesalpiaceae

This species is a large, spreading, deciduous tree (to c. 12m) with bipinnate leaves and masses of bright red flowers. It is native to Madagascar. Growth is most prolific in fertile, well-drained soils. The plant reproduces from seeds which are produced within long pods (each pod contains 20-40 seeds, Smith 1995). *D. regia* is a very popular ornamental tree and has been planted throughout coastal areas of tropical and sub-tropical regions of Australia. In the Northern Territory, it has invaded coastal monsoon vine thickets that have been damaged by cyclones (Cowie, *pers. comm.*). It occurs in patches of rainforest, especially the Daly River monsoon forest, where it becomes obvious when in full flower (Wilson, *pers. comm.*). It has also naturalised in the Darwin region (East Point, Channel Island and around suburban areas), on the Cobourg Peninsula, on the Daly River (Smith 1995), on some offshore, coral cays off Cape York Peninsular and near Cairns (P Stanton, *pers. comm.*). It can form dense canopies that exclude native plants (Smith 1995).

***Echinodorus
cordifolius (L.)
Griseb.***

**burhead, radican's
sword**

Family: Alismataceae

This species is an aquatic plant often confused with *E. berteroi*. It produces burrs on long stems and is used in the aquarium trade in the United States and Australia where it is marketed as 'Radican's sword' (Birkhill *pers. comm.*). The plant prefers the margins of water bodies and is managed in the aquarium trade by maintaining a water depth of about 10cm. It is native to the United States and Mexico (Hosking *pers. comm.*). There are no records of naturalised specimens in Australia despite the fact that it has been widely sold in the aquarium trade for many years in Queensland and New South Wales (Birkhill, *pers. comm.*).

Erica baccans L.

berry-flower heath

Family: Ericaceae

Erica baccans is a shrub (to c. 1.5m tall) with salmon-pink, bell-shaped flowers (Bodkin 1986). The plant reproduces from wind and water-dispersed seeds. It is native to south-east Europe (Swarbrick and Skarratt 1994) and has been sold in Australia as a garden ornamental. Small naturalised populations exist in Victoria (including Cannibal Hill and Arthur's Seat State Park) where it has invaded heathland, woodland, lowland grassland/grassy woodland and dry sclerophyll forest/woodland (Carr *et al.* 1992). It is considered to be a potential weed of Tasmania.

Erica melanthera

erica

Family: Ericaceae

Erica melanthera is a small South African shrub which produces clusters of rose-pink, tubular flowers. It prefers acidic, well drained soils (Bodkin 1986) and has been sold in Australia as a garden ornamental. In Victoria, it exists as small, isolated naturalised populations and is a potential threat to heathland and heathy woodland (Carr *et al.* 1992).

***Erica
quadrangularis***

erica

Family: Ericaceae

This species is native to South Africa and is currently available from some Australian nurseries. It exists as rare or localised, medium to large naturalised populations in Victoria, where it poses a serious threat to lowland grassland and grassy woodland (Carr *et al.* 1992).

***Erythrina
crista-galli***

cockspur coral tree

Family: Fabaceae

Erythrina crista galli is a large shrub or tree (5-15m tall) native to Brazil. It prefers well-drained soils and is drought and frost tender (Bodkin 1986). *E. crista galli* has naturalised at several locations in south-east Queensland and in the Wilsons-Richmond River catchments in northern New South Wales. In south-east Queensland, the plant appears to be restricted to highly disturbed, swampy, low-lying areas that are usually dominated by a range of non-native grasses. It has not been observed to invade relatively undisturbed native vegetation. It is commonly grown in gardens throughout Brisbane for its spectacular red flowers which attract rainbow lorikeets. Ornamental cultivars such as cv *blakei* have been developed and sold by nurseries. Mature trees produce several hundred pods, each containing several seeds, per annum. Pods are probably carried by floodwaters into creeks and wetlands where germination occurs. In Argentina, *E. crista galli* forms pure stands known locally as "seibales" on periodically flooded shores and islands on the Plate Estuary. As such, the plant may have weed potential in low-lying wetland areas/flood plains in tropical and sub-tropical areas in Australia.

***Eugenia
uniflora L.***

**red brazil cherry,
Suriname cherry**

Family: Myrtaceae

This species is an erect, evergreen tree (to c. 6m tall) native to South America. It prefers fertile, moist soils in partially shaded positions (Bodkin 1986). The leaves are dull green and narrowly lanceolate. The flowers are white. The fruit are dark red, ribbed, 2.5cm long, edible, cherry-like berries. Propagation occurs from seed (Bodkin 1986).

***Grewia asiatica* L.**

Family: Tiliaceae

Grewia asiatica is a small tree (to c. 3m tall) believed to be native to India and Nepal. The plant produces fruits that are attractive to birds. The first specimen in Australia was recorded from Darwin, near the botanic gardens (the gardens may have been the original source). Today, the plant is believed to be reasonably widespread in north Queensland with specimens collected from Collinsville, Townsville, Mackay, Ayr, Laura and Cooktown. It was first recorded in Queensland in 1963 (Bean, *pers. comm.*) and is recorded in several locations in the Northern Territory. *G. asiatica* has invaded woodlands in drier parts of Cape York Peninsular, particularly in the Laura-Lakefield area. Near Townsville, it grows on disturbed areas in *Eucalyptus* woodland which are subject to frequent fires; a small population exists on Castle Hill in Townsville. At Laura, it grows in *Eucalyptus* and *Melaleuca* woodland or open forest and is particularly vigorous near the Laura River (Queensland herbarium). It may have the potential to become much more common as it is readily dispersed by birds and is resistant to fire.

***Harungana madagascariensis* (*Choisy*) Poir.**

harungana

Family: Clusiaceae

Harungana madagascariensis is a 'pioneer' tree which grows to a height of some 10-15m. It produces small fruits (2-3mm) which are probably dispersed by birds. The plant is native to Madagascar, Mauritius and tropical Africa where it is widespread and locally abundant in recent secondary regrowth (Keay *et al.* 1960), in areas where annual rainfall exceeds 1300mm. *H. madagascariensis* has a restricted distribution in Australia, centred on the Babinda area in the 'wet tropics' region of coastal, north Queensland. In the wet tropics it has invaded cyclonedamaged rainforest, as well as forest fringes, roadsides and along drains. In some areas it can form dense thickets to the exclusion of other species (Humphries and Stanton 1992). Although currently restricted to disturbed areas, there is concern that this plant may become a permanent component of tropical rainforest communities (Humphries and Stanton 1992).

***Hiptage
benghalensis***

hiptage

Family: Malpighiaceae

A tall, semi-climbing shrub, native to south-east Asia and grown in Australia as an ornamental for its clusters of perfumed white/yellow flowers (Ellison 1995). It prefers climates ranging from warm temperate to tropical and is propagated from seeds or cuttings.

***Hura
crepitans L.***

sand-box tree

Family: Euphorbiaceae

Hura crepitans is a large (c. 10-30m tall) tree native to tropical America (Streets 1962). The trunk is densely covered with hard, sharp spines. The fruit is a capsule, with up to sixteen carpels arranged radially around the central axis, explodes to release seed (Swaine and Beer 1977). Planted in a CSIRO forestry plot at Middle Point, 50km east of Darwin in the mid to late 1960's, it has established populations in surrounding native bushland. At least three other trial plots are believed to exist in the Northern Territory.

***Hygrophila
difformis (L.f.) Bl.***

**water wisteria,
Asian wisteria**

Family: Acanthaceae

No information available.

***Hymenocallis
caribaea* (L.)
Herbert**

spider lily

Family: Amaryllidaceae

Hymenocallis caribaea is a clump forming herb producing bulbs up to 10 cm diameter (Harden 1993). Leaves are long (80 cm) and linear. Usually 6-12 fragrant white flowers per umbel. Grown extensively as an ornamental and naturalised in the catchment of the Macleay River, New South Wales (Harden 1993).

***Hypoestes
phyllostachya*
Baker**

polkadot plant,
freckle face

Family: Acanthaceae

This species is a small shrub often grown in gardens for its attractive leaves which are marked with pink dots. Several cultivars have been developed by the nursery trade. The plant can be propagated by cuttings or from seed. It prefer fertile soils (Ellison 1995).

***Ilex aquifolium* L.**

English holly

Family: Aquifoliaceae

Ilex aquifolium is an erect shrub or tree, to 15m, native to south and west Europe, west Asia and North Africa. It has silver-grey bark, prickly leaves, brilliant red berries and prefers acid, sandy or gravelly loam soils (Bodkin 1986). The berries are probably dispersed by birds. Some nurseries sell the plant as a garden ornamental, particularly in southern States. It has naturalised in New South Wales, Tasmania, South Australia and Victoria (Swarbrick and Skarratt 1994). In Victoria, it exists as small naturalised populations in wet sclerophyll forest and riparian vegetation and is considered to pose a serious threat to native plant species (Carr *et al.* 1992).

***Impatiens
walleriana***
J.D. Hook

balsam, busy lizzy

Family: Balsaminaceae

This species is an evergreen shrub growing to a height of 0.5m. It is native to tropical east Africa and prefers moist, fertile, well-drained soils (Bodkin 1986)-. The stem is thick and succulent and the leaves are ovate-acuminate, with serrate margins. The flowers are bright red and arranged singularly or in pairs in the leaf axils (Bodkin 1986). Propagation is from seed or cuttings. The plant has naturalised on basalt soils in Palmerston National Park (north Queensland). It colonises forest margins and is displacing native fern communities around waterfalls (Tucker, *pers. comm.*). It has also naturalised in riparian habitats and other moist areas in south east Queensland (Guymer, *pers. comm.*).

Iris orientalis
Miller

Family: Iridaceae

Iris orientalis is grown as a garden ornamental in Australia and has naturalised along streams of the southern Lofty Ranges in south-east South Australia (Hosking, *pers. comm.*, Hnatiuk 1990). It may have the potential to become more abundant in freshwater wetlands and riparian vegetation in areas with a temperate climate. Two related species, *I. pseudacorus* (yellow water iris) and *I. spuria* (iris) are environmental weeds in Victoria (Carr *et al.* 1992).

Ixia longituba

Family: Iridaceae

This species has naturalised in bushland near Melbourne. It may have the potential to become more abundant in freshwater wetlands and riparian vegetation in areas with a temperate climate. Six other *Ixia* species have naturalised in Australia (Hnatiuk 1990).

***Jasminum
polyanthum***
Franchet.

winter jasmine

Family: Oleaceae

Jasminum polyanthum is an evergreen vine (up to c. 3m in height) with a woody, slender twining stem (Bodkin 1992). It is grown in gardens for its highly perfumed flowers. The buds are pink but the tubular flowers are white and often tinged in pink. The leaves are thin, leathery and glabrous but there are cultivars with variegated foliage (Ellison 1995). In China it is cultivated for its aromatic oil and ornamental value. It is native to China (Bodkin 1992).

Juncus acutiflorus
Ehrh.

Family: Juncaceae

Juncus acutiflorus is a shortly rhizomatous perennial (Harden 1993). It is a native of Europe, north west Africa and south west Asia, now naturalised in swampy areas at Wentworth Falls (Blue Mountains) (Harden 1993). It may have pest potential comparable to a related species, *J. acutus* L., which is a noxious weed that grows in low-lying, poorly drained areas and wetlands.

***Juncus
canadensis***
Gay

Family: Juncaceae

Juncus canadensis is a tufted perennial; native to north America and naturalised in swampy areas around Wentworth Falls (Harden 1993). See comments as for *J. acutiflorus* above.

***Khaya
senegalensis***

**African mahogany,
Senegal mahogany**

Family: Meliaceae

Note: Identification of species nominated is uncertain (possibly two species involved).

This species is widely grown as a street tree and may have the potential to colonise the edges of rainforest remnants in tropical climates. It has been planted in the Kimberley region (Western Australia) as a street tree and Mitchell (*pers. comm.*) reports large numbers of juvenile plants around Mitchell Plateau in the Kimberley.

***Kniphofia
uvaria***
(L.) J.D. Hooker

red hot poker

Family: Aloeaceae

Kniphofia uvaria is an erect, perennial herb growing up to 3m tall. It is native to South Africa. The greenish blue leaves are linear and arranged in a basal rosette. The flowers are red, occurring in a dense, erect, terminal spike, 50cm long (Bodkin 1986). *K uvaria* is commonly planted as a garden ornamental and widely available from nurseries. The plant's seed is wind-dispersed. It exists as small populations in Victoria, where it has invaded dry coastal vegetation, heathland and heathy woodland (Carr *et al.* 1992). It is also recorded to occur in South Australia (Robertson 1983).

***Koelreuteria
elegans***

Syn. K. paniculata

**Chinese rain tree,
flame gold, golden
rain tree**

Family: Sapindaceae

Koelreuteria elegans is a small deciduous tree with terminal panicles of yellow flowers (Ellison 1995) and bipinnate leaves (Bodkin 1992). It can be propagated from seeds and tolerates a range of soil types. It is cold tolerant and there are a number of subspecies used in horticulture as ornamentals (Ellison 1995). There is some confusion between *K elegans* and *K paniculata* as the latter is also referred to as the Golden rain tree. *K elegans* has inflated fruit with pinkish capsules while *K paniculata* has longer brown pods (Griffiths 1994). *K elegans* is native to Taiwan (Griffiths 1994) and has been listed by the Brisbane City Council as a weed of bushland around Brisbane.

***Lachenalia* spp.**
(*L. aloides* var. *aurea*
(Lindl.) Engl., *L.*
bulbifera
(Cirillo) Engl.,
***L. mutabilis* Sweet.,**
***L. reflexa* Thunb.)**

Family: Liliaceae

This genus comprises 88 named species and approximately 20 undescribed species (Duncan 1988). All species are perennial, tuberous herbs, native to Southern Africa. An unknown number of species have been imported by the nursery trade for use as flowering bulbs. *Lachenalia* spread vegetatively (eg. as a contaminant of soil) or via masses of small, wind-dispersed seed. Some species are currently being trialed as ornamental pot plants.

In Western Australia, at least four species of *Lachenalia* have naturalised, viz. *L. aloides* var *aurea* (Lindl.) Engl., *L. bulbifera* (Cirillo) Engl., *L. (?) mutabilis* Sweet and *L. reflexa* Thunb. (Keighery, undated). They are all localised but are spreading in the tuart and banksia woodlands in south-western Western Australia. *Lachenalia* appear to be tolerant of fire and regenerate soon after bushfire (Keighery *pers. comm.*). *L. reflexa* is currently the most widespread species in Western Australia, where it is replacing native annual and herbaceous species. It poses a considerable threat to bushland areas with sandy or calcareous soils (ie. most of the Swan Coastal Plain in south-west Western Australia) (Keighery, undated). *L. aloides* (variety unknown) has formed small populations in Victoria, where it has invaded lowland grassland and grassy woodland (Carr *et al.* 1992). *L. bulbifera* and *L. aloides* (var. unknown) exist as garden escapes in South Australia (Hewson 1987, Moot 1986).

Leycesteria
***formosa* Wall.**

Himalayan honeysuckle

Family: Caprifoliaceae

This species is a large (to 2.5m), deciduous shrub native to the Himalayas. The leaves are heart-shaped and acuminate. The flowers are purple and white, occurring in pendant, leafy chains. The fruit are black berries, almost enclosed in purple, leafy sheaths. *L. formosa* prefers well-drained soils (Bodkin 1986). It has been sold as a garden ornamental and has escaped cultivation (aided by its bird-dispersed berries). It has a limited distribution in Victoria (medium to large naturalised populations), where it has invaded damp/wet sclerophyll forests and riparian vegetation (Carr *et al.* 1992). It can be found in Mt Buffalo National Park, the Otways, private gardens in Victoria (Blood *pers. comm.*) and Tasmania (Swarbrick and Skarratt 1994). It is very common in New Zealand and is expected to become common in Victoria (Blood *pers. comm.*).

***Lilium
formosanum***
Wallace

Taiwan lily

Family: Liliaceae

Lilium formosanum is a bulbous geophyte native to Taiwan. It can be dispersed via wind or water. Carr *et al.* (1992) reported that the plant exists as rare or localised, medium to large, populations have invaded damp sclerophyll forest in Victoria. It has also naturalised in Queensland (Toowoomba and Maleny), New South Wales (Sydney) and on Lord Howe Island (Swarbrick and Skarratt 1994).

***Macfadyena
unguis-cati* (**
L.) Gentry

*Syn. Doxantha
unguis-cati*

cat's claw creeper

Family: Bignoniaceae

Macfadyena unguis-cati is an aggressive, woody vine which can climb to a height of 30m (stem diameter can reach 15cm). The leaves are trifoliate, with tapering oblong leaflets and the terminal leaflet has a claw-like tendril. It produces long (c. 30cm) seed pods which contain flattened wind-dispersed seeds. Native to tropical America, it has been imported and grown in Australia as a garden ornamental. It prefers fertile, well drained soils, but appears to tolerate most soil types, particularly alluvial soils. Root tubers and stolons form in the plant's second year and can subsequently form at each leaf node while the vine is prostrate. As such, the plant can form a dense mat which carpets the forest floor. The vine climbs standing vegetation and can smother native trees and shrubs. It has invaded riparian vegetation in south-east, coastal Queensland and in north-east, coastal New South Wales. Plant communities at risk include riparian and rainforest communities in sub-tropical and tropical zones in eastern and northern Australia. Control is very difficult and labour intensive.

***Macroptilium
atropurpureum* (DC.) Urb.**

siratro

Family: Fabaceae

This leguminous, scrambling vine was introduced into Australia from tropical America. It is widely used as a pasture species throughout coastal eastern Queensland and coastal New South Wales. The leaves are trifoliate and the flowers are purple and pea-like. Spread occurs from seed. Naturalised specimens are common in Queensland, Western Australia and the Northern Territory, primarily in high rainfall tropical and sub-tropical coastal areas. It can form dense infestations in highly disturbed areas (areas that are not grazed by domestic stock) and it has become common in riparian vegetation and coastal sand dune vegetation near Brisbane. Dense growth can smother young trees in areas undergoing revegetation.

***Mahonia
leschenaultii* (Wallich) Takeda**

Family: Berberidaceae

Mahonia leschenaultii is an evergreen shrub with leaves borne on short shoots. Leaves are coarsely toothed with spiny teeth. Produces yellow flowers and blue berries. Native to India and east Asia, is the only species in Australia, often cultivated as an ornamental and occasionally naturalised in gullies in the Blue Mountains (Harden 1990).

Mareya aristata

Family: Euphorbiaceae

Mareya aristata is a weed of roadsides in South Australia. It is native to South Africa where it is almost extinct (Hosking *pers. comm.*).

***Maurandya
barclaiana* L.**

Family: Scrophulariaceae

This species is a slender perennial vine (to c. 2m), native to Mexico. It prefers fertile, well drained soils (Bodkin 1986). The leaves are heart-shaped, acuminate and deep green. The flowers are violet-blue, trumpet-shaped with white throats. It is propagated from seed (Bodkin 1986). It is occasionally grown for its showy flowers and is rarely naturalised along the coastal districts north of Sydney to Queensland (Harden 1992).

***Monadenia
bracteata* (
Sw.) Durand
and Schinz.**

**South African
orchid weed**

Family: Orchidaceae

Monadenia bracteata is a perennial, tuberous plant growing to 75cm. It is often confused as an Australian native orchid, but is native to South Africa. It was introduced into Australia as a garden ornamental. Reproduction occurs via tubers and wind-dispersed seed (Swarbrick and Skarratt 1994). Naturalised populations exist in South Australia and Western Australia, along the edges of peat bogs and within grasslands, sclerophyll forest and grassy eucalypt forest (Swarbrick and Skarratt 1994). It is recorded to exist at three locations in Victoria (relatively small populations), viz. Lower Glenelg National Park, White Elephant Hills near Bacchus Marsh and Hurstbridge near Melbourne (Blood *pers. comm.*). Eradication may be possible in Victoria, provided hygiene from South Australia and Western Australia can be implemented and provided the eradication program is long enough to remove the soil-seed bank (Blood *pers. comm.*).

***Neonotonia
wightii***
(Arnott) Lackey

Syn. *Glycine wightii* (Arn.)
Verdc., *G. javanica* L.,
Notonia nwrightii Arr.

glycine

Family: Fabaceae

This species is a vigorous perennial, twining leguminous vine which can smother grasses and other low-lying vegetation. It produces large numbers of pods (15-35mm long) and reproduces from seeds. It is native to India, Malaysia, Indonesia and tropical Africa (Hacker 1990) and was probably imported into Australia for use as cattle fodder. Naturalised populations are common in coastal and sub-coastal areas of Queensland and New South Wales. Growth is most prolific in tropical and sub-tropical climates where rainfall is 750-1500mm per annum. Several cultivars have been released in Australia for use as pasture legumes.

***Nerium
oleander* L.**

oleander

Family: Apocynaceae

Nerium oleander is a multi-stemmed shrub (to 4m), native to the Mediterranean region. It is adaptable to most soils but prefers an open position (Bodkin 1986). The flowers are generally white or pink, but many different variations have been developed by the nursery trade. It has naturalised in a riparian habitat (following flooding) in central Victoria, where it has produced many seedlings and appears to be very competitive (Robinson, *pers. comm.*). It has also naturalised in Western Australia (Yanchep National Park, Rottnest Island and the Pilbarra) (Swarbrick and Skarratt 1994).

Ochna serrulata
(Hochst.) Walp.

**ochna, mickey mouse
plant**

Family: Ochnaceae

Ochna serrulata is an erect, small shrub (to 1.5m) with yellow flowers and black seeds that are backed by red bracts. The plant is propagated from seeds which are probably dispersed by birds. *O. serrulata* is native to Guinea, west Africa and is grown in Australian gardens for its colourful flowers and seeds. It has naturalised in dry sclerophyll forest and riparian vegetation throughout most of coastal, south east Queensland, but does not appear to have caused significant displacement of native plants. Existing naturalised populations are well beyond eradication. The plant has also naturalised in New South Wales (north-east coastal, Sydney and Lord Howe Island) (Swarbrick and Skarratt 1994).

Olea africana

Syn. *Olea europea*
(L.) ssp. *africana* (Vent.)
P. Green

African olive

Family: Oleaceae

Olea africana is an erect tree (to c. 8m tall) with creamy white flowers that are followed by fleshy berries. It is native to South Africa and prefers fertile, well-drained soils (Bodkin 1986). Propagation is from seed. The berries are probably dispersed by birds or other animals.

***Olea europaea* L.**

olive

Family: Oleaceae

This species is an evergreen tree (c. 5-10m tall), native to the Mediterranean. It is cultivated to produce oil and olives. It has naturalised in several areas of New South Wales, South-east Queensland (eg. St. Helena Island National Park), South Australia, Victoria and Western Australia. Growth is most prolific in semi-arid to sub-humid warm-temperate regions, usually with winter-dominant rainfall and hot, relatively dry summers, on a range of soils (Parsons and Cuthbertson 1992). It is a noxious weed in South Australia (Class 5, when not planted for domestic or commercial use). The subspecies *europaea* is naturalised in Victoria, where it exists as widespread, small populations which have invaded lowland grassland/grassy woodland, riparian vegetation and rock outcrop vegetation (Carr *et al.* 1992). The seed of olives is spread by birds, whereas plants are spread over long distances by the nursery trade. It is becoming a major invading species of parklands, especially near Camden (New South Wales) and in the Adelaide Hills (Parsons and Cuthbertson 1992). Dense growth of olive trees can alter the composition of native plant communities and increase fire hazard.

***Onopordum
illyricum* L.**

Illyrian thistle

Family: Asteraceae

This species is an erect annual or biennial thistle (to c. 2m tall) native to the Mediterranean. It has naturalised in South Australia, New South Wales and Victoria (Hnatiuk 1990) and is a noxious weed in the ACT, New South Wales, Victoria and Tasmania (Parsons and Cuthbertson 1992). It reproduces from wind-blown seed and prefers moderately warm situations (such as rocky hillsides) in subhumid temperate regions. In Australia it is confined to areas with winter-dominant rainfall (600-800mm per annum) and occurs on heavily disturbed land such as neglected sites and pastures (Parsons and Cuthbertson 1992).

***Panicum gilvum*
Lauert**

Family: Poaceae

Panicum gilvum is a decumbent to erect annual grass with stems to c. 70 cm long (Harden 1993). Native to Africa, it is a weed of cultivation, now widely distributed across New South Wales and present in Victoria (Harden 1993). In the ACT it is an invasive grass which has a restricted distribution (Berry and Mulvaney 1995). Suspected of causing photosensitisation in sheep (Harden 1993).

***Parthenocissus
tricuspidata***

**Virginia creeper,
Boston ivy, Japanese ivy**

Family: Vitaceae

Parthenocissus tricuspidata is a deciduous vine (to 15m) with a woody stem and clinging aerial roots. The leaves are palmately divided into lanceolate-acuminate leaflets, with serrate margins, coppery red when young, turning green, then red in autumn (Bodkin 1986). It produces inconspicuous, greenish-yellow flowers which are followed by small, blue-black berries in Autumn. It is native to China and Japan.

***Passiflora
mollisima* (Kunth) L.
Bailey**

Family: Passifloraceae

Passiflora mollisima is a vine which may reach a height of 5m. Native to the Andes of South America, it is sold in Australia for its attractive rose-pink flowers and is occasionally grown commercially for its edible fruit (Ellison 1995). The fruit are yellow, banana-like and about 7cm long. The fruits and seeds are probably dispersed by birds. At present, the plant appears to have a limited distribution in Victoria, where it has invaded wet/damp sclerophyll forests, riparian vegetation and warm-temperate rainforests (Carr *et al.* 1992). It occurs in Tasmania (Port Arthur) (Swarbrick and Skarratt 1994).

***Petasites fragrans* (
Vill.) C. Presl.**

winter heliotrope

Family: Asteraceae

Petasites fragrans is a perennial rhizomatous herb growing to 0.5m. It is native to the western Mediterranean area. It reproduces vegetatively and by seed. The leaves are leathery and acuminate, with a pubescent undersurface. The flowers are, greenish, expanding tubular and strongly fragrant, arranged in terminal clusters (Bodkin 1986). It exists as localised/rare, medium to large naturalised populations in Victoria, where it has invaded damp/wet sclerophyll forest (Carr *et al.* 1992).

***Phormium
tenax*
Forster and Forster**

New Zealand flax

Family: Agavaceae

This species is a perennial rhizomatous herb (to c. 2m tall) native to New Zealand. The stems are short and stout. The leaves are strap-like, deep green, clump forming and fibrous. The flowers are red and orange, occurring in terminal sprays. It is available from nurseries and is dispersed by water and wind. It has naturalised in Victoria, where it exists as rare or localised populations in freshwater wetlands (Carr *et al.* 1992).

***Phyllanthus
emblica***

**Indian gooseberry,
myrobalan**

Family: Euphorbiaceae

Phyllanthus emblica is an evergreen tree (to c. 17m tall) native to tropical Asia. The flowers are small, yellow and arranged in clusters in the leaf axils. The fruit are yellow berries, 2.5cm in diameter (Bodkin 1986).

***Phyllostachys
nigra* Munro**

black bamboo

Family: Poaceae

Phyllostachys nigra is native to southern China. It can grow to 8m tall and produces thick canes that become shiny black in their third season (Taylor 1992). It is currently being sold by nurseries in Queensland (eg. 'Bamboo Australia') and possibly other States. *P nigra* ff *boryana* is a larger variant (grows to 12m), used widely in the furniture trade as the culms are speckled with attractive brown, cloud-like dots. *P nigra* f. *henonis* grows to 10m and is grown to produce vegetable shoots and timber for brooms, fences and crafts ('Bamboo Australia' catalogue 1993). A species of *Phyllostachys* has naturalised on Lord Howe Island where it is preventing regeneration of lowland palm forest (Pickard 1983). It persists in abandoned gardens and is naturalised in several areas of central coast New South Wales (Harden 1993).

***Pinus halepensis*
Miller**

aleppo pine

Family: Pinaceae

Pinus halepensis is an evergreen tree (to c. 20m tall) best suited to a Mediterranean climate (250-800mm rainfall per annum and 7-8 rainless months) (NAS 1980). The stem is twisted and branching with ash-grey bark, ageing to reddish brown. It reproduces from wind-blown seed (Swarbrick and Skarratt 1994) and has naturalised in South Australia.

Pistacia chinensis**pistachio nut tree****Family: Anacardiaceae**

Pistacia chinensis is a deciduous tree growing to 13m tall. It is native to Afghanistan (Ellison 1995). The compound leaves turn brilliant red in autumn. The flowers are inconspicuous and the fruit are small, blue berries. It has naturalised in the Armidale and Tamworth areas (Hosking, *pers. comm.*) and in the Hawkesbury /Nepean catchment. It is grown as a garden ornamental for its colourful autumn foliage (has been promoted for planting in gardens as a substitute for the poisonous Rhus tree).

Plumeria spp.**frangipani****Family: Apocynaceae**

An unidentified species of *Plumeria* (probably one of the many cultivars of *PP rubra*) has formed a continuous canopy in parts of Hawaii above 400m. *PP rubra* is very common in gardens throughout tropical and sub-tropical regions of the world, including Australia, and numerous cultivars have been developed by the nursery trade. A species of *Plumeria*, most likely *P rubra*, has naturalised at several locations in north Queensland; in wetter uplands and foothills of wet tropics (at altitudes between 150m and 800m); in the Dirun River catchment; and the Ithica creek catchment (Tucker, *pers. comm.*).

***Polygala virgata*
Thunb.****polygala, purple broom****Family: Polygalaceae**

Polygala virgata, a South African shrub to 2m in height. The stems are erect and cane-like. Flowers are pale mauve-pink, occurring in terminal clusters. Reproduces from seeds and has naturalised in coastal dune vegetation and in woodlands (Swarbrick and Skarratt 1994) in Queensland (Toowoomba), coastal New South Wales, Western Australia and Victoria. In Victoria, it exists as localised, small populations and is a serious threat to lowland grassland and grassy woodland (Carr *et al.* 1992).

Praxelis clematidea
(Griseb.) R.M.
King and H.
Rob.

Family: Asteraceae

An erect, annual herb to decumbent sub-shrub with very brittle stems. It can grow up to c. 1.2m tall but most plants are c. 40-80cm (B. Waterhouse *pers. comm.*). The leaves are opposite, pubescent, ovate to deltoid in shape with an acute apex and conspicuously serrated margins (laminae: 2.5 - 6cm x 1 - 2cm). The flowers are purplish-blue and the plant can be confused with billy goat weed (*Ageratum houstonianum* and *A. conyzoides*). Native to South America, and first discovered in Australia in coastal north Queensland (Tully) in 1993. Firmly naturalised in the Tully region, where it has excluded other vegetation.

Prunus
***laurocerasus* L.**

cherry laurel

Family: Rosaceae

PP *laurocerasus* is a tree (to c. 10m) native to eastern Europe and western Asia. It is adaptable to most soil types (Bodkin 1986). The leaves are thick, alternate, glossy green, 17cm long, with slightly serrate margins. The flowers are small, white and 5-petalled, occurring in simple, axillary racemes. The fruit are cherry-like and glossy black, currying in grape-like clusters (Bodkin 1986). It was probably introduced into Australia for use as a garden ornamental and is currently available from nurseries. The fruit are dispersed by birds. It has naturalised in Victoria, where it exists as medium to large populations (with a limited distribution) in damp/wet sclerophyll forests and riparian vegetation (Carr *et al.* 1992). Naturalised specimens also exist in South Australia (Mt Lofty and Adelaide) (Swarbrick and Skarratt 1994).

Psoralea
***pinnata* L.**

blue psoralea, African
scurf pea

Family: Fabaceae

Psoralea pinnata is an evergreen shrub (to c. 5m) native to South Africa. It prefers sandy, well-drained soils (Bodkin 1986). The flowers are blue and pea-shaped, occurring in clusters. The plant reproduces from seeds and is currently available from nurseries. Dispersal is by water. It has naturalised in Victoria, where it exists as widespread medium to large populations in dry coastal vegetation, heathland and heathy woodland, lowland grassland and grassy woodland and dry sclerophyll forests (Carr *et al.* 1992). The plant has also naturalised in New South Wales (Sydney), Tasmania and Western Australia (Swarbrick and Skarratt 1994).

***Puccinellia
ciliata* Bor.**

Family: Poaceae

This species has naturalised in New South Wales and Western Australia. It has been used for salt land reclamation and was first reported in Entwistle (1994). Closely related to *P stricta*, but has a more open panicle (Harden 1993).

***Pyracantha
augustifolia* (
Franchet)
Schneider**

firethorn

Family: Rosaceae

Pyracantha augustifolia is a large shrub (to c. 3m tall) native to western China. It produces small, white flowers followed by masses of bright orange/red berries that can be dispersed by birds or flowing water. The plant is available from some nurseries. At some locations in Australia, *P augustifolia* has formed dense thickets which exclude native shrubs and other understorey plants. In Victoria, the plant exists as small populations (scattered over a large area), primarily in lowland grassland/grassy woodland, dry/damp sclerophyll forests and riparian vegetation (Carr *et al.* 1992). It is considered to pose a very serious threat to one or more vegetation formations in Victoria (Carr *et al.* 1992). The plant has also naturalised in eastern and north-eastern New South Wales (Hnatiuk 1990), New South Wales (Sydney) and is widespread in the ACT (Swarbrick and Skarratt 1994). In Queensland, it exists along creek-banks near Warwick in south-east Queensland.

***Pyrus
calleyerana***

Family: Rosaceae

Pyrus calleyerana is an erect, thorny, deciduous tree (to c. 8m tall) with glossy green, broadly oval leaves, white flowers and small brown drupes. It has the potential to become an environmental weed in the humid, temperate zone of south-east Australia (including ACT).

Pyrus ussuriensis

Manchurian pear

Family: Rosaceae

A deciduous tree (to c.7m tall) with white flowers and yellowish-green fruit (ponies). It is native to north-east Asia (Bodkin 1986) and has the potential to become an environmental weed in the humid, temperate zone of south-east Australia (including ACT).

***Quisqualis indica* L.**

rangoon creeper

Family: Combretaceae

Quisqualis indica is an evergreen vine (to c. 3m tall) with oval leaves (c. 10cm long) and red or orange-red flowers. Native to Malaysia, it exists around old settlements in the Northern Territory and is showing signs of weediness (Dunlop, *pers. comm.*).

***Rhaphiolepis indica* (L.) Ker Gawler**

Indian hawthorn

Family: Rosaceae

Rhaphiolepis indica is an evergreen shrub (to c. 2m tall) with profuse white flowers in terminal panicles. The small blackish berries (Bodkin 1986) are dispersed by birds (Swarbrick and Skarratt 1994). Native to China, it has naturalised in remnant bushland in Brisbane and Sydney. Planted as a garden ornamental it is propagated from seeds or cuttings.

Rosa X odorata

Family: Rosaceae

Rosa X odorata is a thorny, semi-evergreen shrub which grows to 2m. The double flowers are soft pink or yellow and about 4cm in diameter. The fruit are fleshy, red hips (Bodkin 1986). Native to Asia, it now has a restricted distribution in the ACT, and has significant weed potential (Berry and Mulvaney 1995).

***Rubus
roribaccus*** Rydb.

dewberry

Family: Rosaceae

Rubus roribaccus is a vigorous semideciduous climber with prickles on the canes (Harden 1990). The fruit are purple to black oblong berries. It has a restricted distribution in the ACT where it has significant weed potential (Berry and Mulvaney 1995) but is not widely naturalised in New South Wales (Harden 1990).

***Ruellia
squarrosa***

ruellia

Family: Acanthaceae

Ruellia squarrosa is an open, spreading shrub with blue to cerise flower. It is native to Africa and is sold as a garden ornamental.

***Sanchesia
parvibracteata***
Sprague and
Hutchinson

sanchezia

Family: Acanthaceae

Sanchesia parvibracteata is a shade-loving shrub (to c. 5m tall) native to tropical South America. It has showy, large leaves (12-25cm) with striking yellow venation and is widely grown in Queensland gardens (Humphries and Stanton 1992). It can form dense thickets which exclude most other vegetation. The plant strikes readily from small fragments and suckers profusely, especially along creek lines, areas disturbed by feral pigs and the moist edges of tropical rainforests. Fragments of the plant are carried into new areas by flowing water. It has a scattered but widespread distribution in the 'wet tropics' region of coastal, north Queensland and is predicted to become much more common.

***Sansevieria trifasciata* Prain**

mother-in-law's-tongue

Family: Agavaceae

Sansevieria trifasciata is a perennial plant which reproduces from rhizomes. Native to west Africa it has naturalised in urban bushland around Brisbane and on nearby islands in Moreton Bay. It is widely planted as a garden ornamental and has probably been spread into new areas as a result of people dumping garden waste.

Schoenoplectus californicus

Family: Cyperaceae

This species was first found in Australia in 1995 by G. Sainty and is reported to tolerate brackish water. It occurs in the Raymond Terrace area of New South Wales.

***Senecio angulatus* L.**

climbing groundsel

Family: Asteraceae

Senecio angulatus is a perennial vine which reproduces vegetatively. It was probably introduced as a garden ornamental as it is currently available from nurseries. Native to South Africa, it has naturalised in Victoria in localised small populations, and is a serious threat to dry coastal vegetation, lowland grassland/grassy woodland, dry sclerophyll forest/woodland and saline/sub-saline wetlands (Carr *et al.* 1992). *S. angulatus* is often confused with cape ivy (*Delairea odorata*) and probably more widespread in Victoria than thought in 1992, particularly in gardens and public land along the coast (Blood *pens. comm.*).

Senecio glastifolius

Senecio glastifolius is a herb which spreads via wind-blown seed (Swarbrick and Skarratt 1994). It may have weed potential in woodlands in the Albany area of Western Australia.

Senna pendula
(Willd.)
Irwin and Barnaby

Syn. *Cassia bicapsularis* L. **easter cassia**

Family: Caesalpiniaceae

Senna pendula is a small South American shrub (2-5m) which produces masses of bright yellow flowers in March/April, followed by hundreds of pods each containing 5-10 seeds. The pods can be transported by flowing water. The plant is very common in gardens in Brisbane and has naturalised in highly disturbed urban bushland and farmland throughout much of coastal south-east Queensland and northern New South Wales, primarily along roadsides and the banks of watercourses. It is not considered to be a significant threat to native bushland.

Steirodiscus
chrysanthemoides

Family: Asteraceae

This species is a weed of roadsides from Wollongong to Sydney. It is native to South Africa.

Stephanophysum
***longifolium* Pohl.**

Family: Acanthaceae

Stephanophysum longifolium has recently invaded disturbed rainforest along the lower Mulgrave River in coastal north Queensland (Stanton, *pers. comm.*). It may have the potential to spread.

Succowia
balaerica

***Tephrosia
glomeruliflora***
Meissner

pink tephrosia

Family: Fabaceae

Tephrosia glomeruliflora is an erect woody herb, pubescent, growing to 2m. Pink to mauve pea shaped flower and linear pods. Native to South Africa and reproduces from seed (Swarbrick and Skarratt 1994). It has naturalised in urban bushland in Brisbane and is cultivated in gardens as an ornamental. Occasionally naturalised north from Wollongong (Harden 1991).

***Thaumastochloa
danielii***

sweet prayer plant

Family: Marantaceae

Thaumastochloa danielii was imported into Australia in the late 1980's as a potential source of food/beverage sweetener. It is a large, extremely aggressive plant which quickly becomes locally invasive once planted. To date, naturalised specimens have only been observed on the edges of tropical rainforest, but it may have the potential to become a major pest in the future. Humphries and Stanton (1992) recommended eradication.

***Thunbergia
laurifolia***
Lindley

Syn. T. harrisii Hook.

laurel clock vine

Family: Acanthaceae

Thunbergia laurifolia is a large aggressive vine with large lilac flowers. It is very similar in appearance to *T. grandiflora* (listed in Table 3) with a similar capacity to smother coastal, lowland rainforest in tropical north Queensland. It was recommended for declaration in Queensland in 1993 (Csurhes 1993) and is now declared in Category P2 as an eradication target. At present, it is much rarer than *T. grandiflora*. The largest infestation found to date was in the Freshwater valley near Cairns. Other smaller infestations exist around Cairns and Innisfail (Stanton, *pers. comm.*). It is grown as a garden plant around Darwin (Smith 1995), but has not yet naturalised. It is native to India and Malaysia.

***Tribolium
uniolae* (L. f.)
Renvoize**

Syn. *Plagiochloa uniolae*

Family: Poaceae

This species is native to South Africa and may have serious weed potential on clay soils in some areas of Western Australia. In Western Australia it is growing on verges and invading bushland of the Darling Range and suburban wetlands of Perth (Keighery 1994).

***Turbina
corymbosa* (
L.) Raf.**

turbina

Family: Convolvulaceae

Turbina corymbosa is a herbaceous or sub-woody vine (to 1 Om) native to tropical America. It produces white flowers and has been planted as a garden ornamental. It has naturalised in thickets and rainforest margins in the drier end of the 'wet tropics' region of coastal, north Queensland (Humphries and Stanton 1992) and in riparian vegetation along the Barron River, near Cairns (Swarbrick and Skarratt 1994). Seed production can be prolific (during May and June). Seed may be dispersed by birds and water. It is currently spreading rapidly along the Barron River where it is smothering trees, in a manner similar to *Thunbergia grandiflora*.

***Xanthosoma
violaceum***

blue taro

***Yucca
aloifolia* L.**

**coastal yucca,
dwarf yucca,
Spanish bayonet**

Family: Agavaceae

Yucca aloifolia is an evergreen plant (to c. 1.5m tall) with greyish-green, narrow, spear-like leaves arranged in a basal rosette. The flowers are white and bell-shaped, arranged in erect, terminal spikes. Propagation is by seed (Bodkin 1986). It is common around old habitation but does not yet appear to be fully naturalised (Harden 1993). It is present on the north coast of New South Wales and Queensland (Harden 1993).

***Zephyranthes
grandiflora*
Lindley**

pink storm lily

Family: Amaryllidaceae

Zephyranthes grandiflora is a perennial plant (c. 0.3m tall) with glossy, linear leaves and rosepink, funnel-shaped flowers. Propagation is by bulb division (Bodkin 1986). Native to Mexico, it is found on the far north coast of New South Wales but does not appear to be fully naturalised although it is a garden escape (Harden 1993). Closely related to *Z. candida* which is also cultivated and occasionally naturalised in similar range to *Z. grandiflora* (Harden 1993).

APPENDIX C

Potential environmental weed species that have histories as weeds overseas but are too widespread to, be eradicated from Australia.

***Acer negundo* L.**

box elder maple,
ash-leaved maple

Family: Aceraceae

Acer negundo is a deciduous tree (to c. 20m tall) with compound leaves comprised of 3-7 leaflets. It is usually dioecious. The seeds are held in double-winged pods (c. 4cm long) that hang in long chains on slender stalks. The seeds/pods are dispersed by wind, birds and animals. Reproduction generally occurs from seed. New shoots are induced following fire (Anon. 1996e). Germination, establishment and growth rates tend to be highest on disturbed, open sites with moist soil (conditions that often occur along the banks of rivers and creeks).

A. negundo is native to North America (Anon. 1996a) where it occurs from Ontario to Florida in a range of ecosystems, usually at elevations of about 1000m (Anon. 1996a). It exists in Guatemala (Anon. 1996) and has been recorded as a weed in the United States (Holm *et al.* 1979). Garden specimens exist in most States of Australia and several varieties are sold by nurseries (Anon. 1996d). Naturalised populations exist in New South Wales. Carr *et al.* (1992) believe the plant has the potential to become an environmental weed in many vegetation communities in Victoria, including dry, coastal vegetation, heathy woodlands, grassy woodlands, dry and damp sclerophyll forests and woodlands.

***Acer
pseudoplatanus* L.**

sycamore maple

Family: Aceraceae

Acer pseudoplatanus is a deciduous tree up to 30m tall. It is grown as a garden ornamental and several cultivars have been developed; cv *purpureum* has young maroon foliage and older dark green leaves, whereas cv. '*brilliantissimum*' has bright yellow spring foliage. Flowering can occur at exceptionally low temperatures, an adaptation that has enabled this species to survive in cold climates (Piggott and Warr 1989). It produces winged seeds that are dispersed by wind and water.

A. pseudoplatanus is native to the mountains of central and southern Europe and the Caucasus, where it grows in high rainfall areas (800-1000mm per annum) at altitudes of 200-1500m in beech and spruce forests. It has naturalised much further north than its natural northern limit and can be found, from the Mediterranean to Scandinavia and the United Kingdom. In the United Kingdom, it has become a common invasive tree of woodlands (Piggott and Warr 1989). It is grown as a garden ornamental throughout southern Australia, mainly in the temperate humid zone where annual rainfall exceeds 1000mm per annum.

It has naturalised at many locations and is recognised as a bushland weed in Tasmania, Victoria (Mt Macedon, the Dandenongs, Mt Franklin near Daylesford and the Ferntree Gully National Park) (Swarbrick and Skarratt 1994), South Australia (southern Lofty region, Hnatiuk 1990) and New South Wales Qenolan area of the central tablelands, Harden 1991). It competes with native tree species, especially in riparian vegetation and wet sclerophyll forests associated with high rainfall areas and temperate climates (Carr *et al.* 1992). The plant is too widespread for nation-wide eradication to be considered. Strategic control of isolated, small infestations may be feasible in some areas.

***Achillea
ptarmica* L.**

**sneezewort,
adder's tongue,
wildfire**

Family: Asteraceae

Achillea ptarmica is a perennial plant which can grow to 1m in height. Dense, flat-topped clusters of yellow, daisy-like flower heads are produced in mid-summer and autumn. The leaves are linear, narrowed at their bases and pointed at their tips. The plant is adaptable to most soils and conditions and is drought and frost resistant (Bodkin 1991). Cultivars are used in the United States as garden plants and to produce cut flowers (Armitage 1992). *Achillea* species hybridise readily and correct identification can be difficult.

A. ptarmica is recorded as a weed in Finland (Holm *et al.* 1979) and is believed to be native to Europe. It has been recorded to occur in the maritime provinces of Canada and the New England region of the United States, but it is not known whether these populations are naturalised. In Australia, the plant's distribution is unclear. It has been recorded to occur in Tasmania (Tasmanian Herbarium record), but there are no records of the plant elsewhere in Australia.

Based on the plant's overseas distribution, *A. ptarmica* appears climatically suited to temperate humid and sub-humid zones of southern Australia. However, there is insufficient information in the literature to enable an assessment of the plant's potential environmental impact. Since a closely related species, *A. millefolium*, is listed as a significant threat to several vegetation formations in Victoria (Carr *et al.* 1992), it may be assumed that *A. ptarmica* may also have some weed potential. It is difficult to assess the feasibility of eradicating this plant.

***Aegopodium
podagraria* L.**

**goutweed,
bishop's weed,
ground elder**

Family: Apiaceae

Aegopodium podagraria is a perennial plant with erect, hollow grooved stems (c.1m tall) and aggressive, spreading rhizomes (Harden 1992). It produces small, white flowers, which form compound umbels. Growth is most prolific in moist conditions and semi-shade. Holm *et al.* (1979) listed *A. podagraria* as a common weed in the Soviet Union, Germany and Finland. It is cultivated in European gardens but is recognised as a pest in some gardening books (eg. Everett 1981).

A. podagraria is native to Europe and has naturalised in North America (Everett 1981). In Australia, Hnatiuk (1990) recorded it as naturalised in both New South Wales and Tasmania. The Tasmanian Herbarium has two collections from a single garden-escape site in Hobart (dated 1968 and 1977). Buchanan (*pers. comm.*) reports that it is very rare in Tasmania, however, it is more common in New South Wales in areas near Fitzroy Falls, Canberra and Cooma (Harden 1992).

Due to a scarcity of literature on *A. podagraria*, it is difficult to assess the plant's potential to become an environmental weed in Australia. Hosking (*pers. comm.*) noted that it is an uncommon weed which appears to have weed potential. Similarly, Harden (1992) considered the plant to be a potentially troublesome weed of garden, agricultural land and wasteland. Considering the plant's overseas distribution, the sub-humid and humid temperate zones of southern Australia may be most suitable for growth of *A. podagraria*.

***Alisma lanceolatum*
With.**

water plantain

Family: Alismataceae

Alisma lanceolatum is an erect, aquatic perennial to c. 1m tall (Harden 1993). The leaves are lanceolate and the inflorescence is particulate with white or pink flowers (Harden 1993). It is a weed in Hungary, Italy and Portugal (Holm *et al.* 1979) and is native to the Mediterranean, North Africa and West Asia (Carr *et al.* 1992).

A. lanceolatum inhabits drainage ditches in the Harvey area of south-west Western Australia (Keighery 1994). In Victoria, it exists as widespread, medium to large populations and is a threat to riparian and freshwater wetland vegetation (Carr *et al.* 1992). In New South Wales, it exists in the Riverina and Murray Valley areas (Swarbrick and Skarratt 1994). In South Australia, it is associated with the Murray Valley and the south-east regions of the State (Hnatiuk 1990). It is becoming a serious weed of rice south of Coleambally (New South Wales) (Harden 1993).

In 1995, *A. philoxeroides* was discovered growing in a Brisbane garden. Soon after, a public awareness campaign (conducted by the Queensland Department of Natural Resources) revealed that members of the Sri Lankan community were growing the plant as a vegetable in at least another sixty gardens throughout Brisbane (as well as in many other States). Awareness and control campaigns are currently underway in Queensland and New South Wales, with assistance from the Sri Lankan community (Vitelli *et al.* 1996).

A biological control program for *A. philoxeroides* has been initiated in New South Wales. A beetle (*Agasicles hygrophila*) has achieved some control of the aquatic form, however, it has failed to control the plant's terrestrial form. Chemical and mechanical forms of control are still required, particularly for terrestrial infestations.

A. philoxeroides has the potential to invade inland freshwater river systems and wetlands throughout much of Australia. It can smother native water plants, particularly in water bodies that are subject to pollution from agricultural or urban run off.

***Anacardium occidentale* L.**

cashew nut

Family: Anacardiaceae

Anacardium occidentale is an evergreen tree (c. 12m tall) with simple, oval, alternate leaves (Duke 1993). The inflorescence is a terminal panicle of rose-coloured, perfumed flowers (Bodkin 1991). The fruit are large, fleshy and pear-shaped, up to 20cm long. The tree is frost sensitive but can withstand drought conditions. It prefers fertile, moist soils (Bodkin 1991) but is well adapted to infertile, sandy soils of coastal systems and infertile, shallow, impervious savanna soils (Duke 1993). Propagation is from seeds.

A. occidentale is native to tropical America; from Mexico and the West Indies to Brazil and Peru (Duke 1993). It is now pantropical, especially in coastal areas where it is widely cultivated. Major producers of cashew nuts include India, Tanzania, Mozambique and Kenya (Duke 1993). The plant prefers subtropical climates. It has been recorded as a weed of indigenous flora in South Africa (Wells *et al.* 1986) and as a weed of unknown significance in Mozambique and Jamaica (Holm *et al.* 1979).

A. occidentale is grown as a garden ornamental throughout tropical and subtropical regions of Australia. It is becoming increasingly popular as a commercial plantation nut tree, particularly in the Northern Territory. It has naturalised in the coastal areas north of Broome in Western Australia and is common in and around settlements of the Kimberley (Edwards, unpubl.). The plant has the potential to naturalise much more widely in the monsoon zone of northern Australia. Due to the plant's commercial value, any attempts to eradicate the species may be strongly opposed.

***Andropogon
gayanus* Kunth.**

gamba grass

Family: Poaceae

An erect, tussock-forming perennial grass native to tropical Africa. Grows to 4m and reproduces from seeds (Swarbrick and Skarratt 1994). Originally imported as a pasture grass. In the Northern Territory, it has invaded riparian vegetation (creek banks and flood-plain fringes), degraded areas, roadsides, pastures and *Eucalyptus* savanna, in areas where annual rainfall exceeds 600mm (Smith 1995). It has also invaded Kakadu National Park and is established in the Darwin and Katherine districts. It is reported to be a vigorous, robust grass which forms dense stands, excluding native species. Dense growth of the plant can result in intense fires in the late dry season that damage native plant communities (Smith 1995). It has spread rapidly in the Northern Territory where it has created problems similar to another invasive grass *Pennisetum polystachion*. *A. gayanus* is a serious environmental weed in Venezuela (Smith 1995).

***Annona glabra* L.**

pond apple

Family: Annonaceae

Annona glabra is a semi-deciduous tree, usually 3 - 6m tall. Both the fruit and the seed float (an adaptation which facilitates dispersal in flowing water). The hard seeds can remain viable for considerable periods in either fresh, brackish or sea water. Swarbrick (1993) suggested that long distance transport may be achieved via ocean currents as *A. glabra* is the only species of *Annona* to have spread from tropical America to the west coast of tropical Africa. Frugivores such as feral pigs and cassowaries may also act as vectors of spread by consuming the fruit and defecating the hard seed at new locations. *A. glabra* can behave as a 'freshwater or brackish water mangrove' (Swarbrick 1993) as it can survive root immersion at high tide and prolonged freshwater flooding. Seedlings require ample soil moisture and sunlight to survive (Swarbrick 1993). Such conditions can be expected on riverbanks and in naturally open wetlands or disturbed wetlands and rainforests.

A. glabra is native to fresh and brackish wetlands in tropical North, Central and South America and coastal West Africa (Fries 1962). It has been recorded as a weed in Vietnam (Holm *et al.* 1979). Swarbrick (1993) suggested that *A. glabra* may have been originally introduced into Queensland for use as a wetland rootstock for cultivated species of *Annona*. Scattered naturalised populations exist throughout coastal, north Queensland and it is particularly abundant along the Murray River (Queensland), Nind's Creek (near Innisfail) and the lower Russell River (Swarbrick 1993). Humphries *et al.* (1991) listed *A. glabra* as a significant environmental weed of tropical lowlands. At several locations in coastal wetlands of north Queensland, it has formed dense, monospecific stands that appear to have displaced native grasses, sedges, ferns (such as *Acrostichum spp.*) and tea trees (*Melaleuca spp.*) (Swarbrick 1993) (Plate 11). Loss of native understorey species could preclude fire, leading to further disruption of the floristic composition of native plant communities.

***Anthoxanthum
odoratum* L.**

**scented or sweet vernal
grass**

Family: Poaceae

A perennial grass (to c.1m tall) native to Europe and Asia. It reproduces from seeds that are dispersed by wind, water or animals (Carr *et al.* 1992). It has been recorded as a weed in Columbia, Japan, Chile, Italy, New Zealand and the United States (Holm *et al.* 1979). It is used as a pasture species in Australia and has been recorded to exist in every State, except the Northern Territory (Hnatiuk 1990). Extensive naturalised populations exist in the Ferntree Gully National Park and the Tarra Valley and Bulga National Parks in Victoria. It has the potential to become more abundant in dry coastal areas, riparian habitats, freshwater wetlands, dry and wet sclerophyll forests, grasslands and grassy woodlands (Swarbrick and Skarratt 1994).

***Antigonon leptopus*
Hook and Arn.**

**coral vine,
Mexican rose**

Family: Polygonaceae

This species is a scrambling vine which can climb to a height of up to 10m and smother vegetation underneath. In warm climates it is an evergreen but in cooler areas it is deciduous. The leaves are heart-shaped and up to 12cm long. It is grown in gardens for its trailing sprays of bright pink flowers that bloom over many months. A white-flowering cultivar has been developed by the nursery trade. It tolerates infertile soils and its tuberous roots make control difficult. Reproduction occurs from seeds.

A. leptopus belongs to a group of plants native to Mexico and Central America and is now present in most tropical and subtropical regions. It has been recorded as a weed in Honduras (Holm *et al.* 1979), Guam (Micronesia) and Timor (Wilson *pers. comm.*). In Timor, it covers hillside vegetation, rocky headlands on foreshores and wastelands around Kupang (Wilson *pers. comm.*). It has overgrown most vegetation in many areas of Guam (McConnell and Muniappen 1991).

This species is a common garden plant in Darwin and the Gulf but does not appear to be spreading at these locations (Dunlop *pers. comm.*). It is reported to be spreading, however, in the north Kimberley region of Western Australia (Mitchell *pers. comm.*). Clarkeson (*pers. comm.*) reports that it is common around dump sites on Cape York. It also inhabits rainforest and the margins of mangrove forests in north Queensland (Queensland herbarium). It is available from nurseries in Queensland (Lawson 1996) and Western Australia (Waterhouse *pers. comm.*).

A. leptopus may have the potential to invade riparian vegetation in the monsoon zone of northern Australia (Wilson *pers. comm.*). Cowie (*pers. comm.*) suggests that it may be feasible to control semi-naturalised populations of the plant associated with abandoned settlements and homesteads. In the urban situation, it is very difficult to control due to the persistence of tuberous roots. Continued sale of the plant by nurseries will accelerate its spread.

Araujia hortorum
Fourn.

Syn. *A. sericifera* Brot.,
Physianthus albens C.
Martius

**moth plant, white bladder
flower**

Family: Asclepiadaceae

There has been some confusion regarding the taxonomy of *Araujia hortorum* in Australia and most specimens have been described as *A. sericifera*. Forster and Bruyns (1992) concluded that *A. sericifera* is synonymous with *A. hortorum*.

A. hortorum is a fast-growing, perennial, woody creeper that grows up to 7m tall. Its leaves are arranged in opposite pairs and are glaucous, lanceolate and up to 10cm long (Joel and Liston 1986). If bruised, the stems and leaves exude a smelly, irritating latex (Everett 1981). Flowers range in colour from white to pink or violet and are 8-15mm in diameter. The fruit are fig-like pods that contain seeds encased in kapok-like material (Bodkin 1992). The seeds have a tuft of white hair at their bases to assist dispersal by wind and can remain viable for several years (Swarbrick and Skarratt 1994).

This species is native to southern Brazil and has been recorded as a weed in South Africa and New Zealand (Holm *et al.* 1979). Joel and Liston (1986) recorded *A. sericifera* as a weed in Israel, where it has escaped cultivation and invaded orchards on the coastal plains. In the United States, *A. hortorum* is sold in the nursery trade and has naturalised in temperate and sub-tropical regions. In Australia, the plant is widespread throughout the eastern States, particularly from south-east Queensland south along the coast of New South Wales, where it tends to be associated with rainforest remnants, vine scrubs and wet sclerophyll forests. It has a limited distribution in Victoria, where it has invaded riparian vegetation and damp sclerophyll forest. It does not appear to be in the Australian nursery trade.

Kleinschmidt and Johnson (1979) reported that the plant often fails to persist on grazing land and is of little concern to agriculture. It is most likely to be a problem in derelict and abandoned agricultural land in moist, coastal and sub-coastal areas in regions that have a sub-tropical climate. *A. hortorum* is too widespread to be eradicated but local control measures could be undertaken.

Arrthenatherum
***elatus* (L.) Presi.**
& C. Presi.

tall oatgrass

Family: Poaceae

A loosely tufted perennial up to 1.5m tall. There are several cultivars in use; *A. elatus* var. *elatus* (false oatgrass) which has glabrous basal nodes that are not swollen and *A. elatus* var. *bulbosum* (Willd.) Spenner which has swollen, often hairy, basal nodes (Harden 1993). Var. *bulbosum*, known as onion twitch or bulbous oatgrass, is often a troublesome weed of cultivation and disturbed areas (Lamp *et al.* 1990). There is also a small form of var. *bulbosum* that is used as an ornamental (Harden 1993). *A. elatus* var. *bulbosum* produces corms which can be transported as contaminants of soil.

A. elatius is a weed of natural and man-made grasslands (Harden 1993). It is native to Europe and Asia. It is a common weed in Iran and has naturalised in New Zealand, Uruguay and the United States (Holm *et al.* 1979). In South Africa, it is an environmental weed in summerrainfall regions, where it has replaced native vegetation (Wells *et al.* 1986). In Australia, *A. elatius* is present in all States, except the Northern Territory (Harden 1993), and is common in regions with a temperate climate (Lamp *et al.* 1990). It was introduced as a pasture species in New South Wales (Lamp *et al.* 1990). In Victoria, it is considered to be a potential threat to dry and damp sclerophyll forest, woodland and riparian vegetation (Carr *et al.* 1992).

***Asparagus densiflorus* (Kunth.) Jessop**

Syn. *Protasparagus densiflorus* (Kunth.) Oberm., *P. aethiopicus* (L.) Oberm., *A. aethiopicus* L., *A. sprengeri* Regel,

asparagus fern, sprengeri fern

Family: Liliaceae

This species is a tuberous geophyte with sprawling to pendant stems up to 3m long (Harden 1993). The stems have axillary spines and the leaves are scale-like. The plant produces large numbers of fleshy, red berries which usually each contain a single seed. The fruit is probably dispersed by birds. It is grown as a garden ornamental and several cultivars are available from nurseries (Ellison 1995).

A. densiflorus is native to South Africa (Carr *et al.* 1992) where it occurs in a range of coastal habitats including rocky areas and woodlands Qessop 1966 in Bowden and Rogers 1996). It has naturalised in the southern United States (Shelter and Skog 1978 in Bowden and Rogers 1996).

A. densiflorus has naturalised in south-east Queensland and along the coast of New South Wales, where it has invaded coastal, littoral rainforest, rainforest, frontal dunes and sclerophyll forest and coastal heath (Swarbrick and Skarrett 1994, Hnatiuk 1990). It is considered to be a serious weed of coastal bushland around Sydney (Harden 1993). Heavy infestations exist on the western edge of Burleigh Heads National Park, Queensland (Bowden and Rogers 1996). There is concern that dense growth of *A. densiflorus* may smother native understorey plants. It has been declared a noxious weed on Lord Howe Island (Harden 1993). Physical and chemical control tend to be very difficult. Biological control agents are being investigated (Parsons and Cuthbertson 1992).

***Azadirachta indica* A. Juss.**

Syn. *Melia azadirachta* L., **neem**
Antelaea azadirachta (L.)
Adelbert

Family: Meliaceae

Azadirachta indica is an evergreen tree (up to c. 30m tall) with perfumed cream flowers arranged in axillary clusters. Its yellow fruit are sought after by birds and bats (Anon. 1992, Hearne 1975). Suckers may be produced following damage to the roots (Hearne 1975). Propagation occurs from seeds, tip-cuttings, saplings and root suckers (Anon. 1992, Hearne 1975). Selected cultivars are grown from cuttings. It is susceptible to frost, fire, waterlogging and high winds (Anon. 1992).

A. indica is native to the coastal fringe forests of the drier tropical regions of India, Burma and Sri Lanka, usually occurring on deep, sandy soils (Hearne 1975). It is cultivated in tropical to subtropical regions, semi-arid to wet tropical regions, from sea level to about 700 m elevation (Anon. 1992). It has been observed to grow well in dry, infertile sites (Anon. 1992) but grows best when provided with adequate water (Ellison 1995). It is used in silviculture in India and for reforestation in Asia, Central America and the sub-Saharan region (Maramorosch undated). Live specimens are susceptible to borers and termites (Hearne 1975). The leaves have been used in India as a green manure (Hearne 1975). After the oil has been pressed from the seeds, the residue ('neem cake') can be used in cattle and poultry feed (Anon. undated). The seeds and leaves contain azadirachtin which is being investigated as a potential insecticide (Howatt undated). It is established in south-east Asia, Africa, Fiji, Mauritius, the Caribbean and many countries of South and Central America.

A. indica has been recorded as a weed in India (Holm *et al.* 1979). Anon. (1992) claimed that "although widely naturalised, it has nowhere become a pest". There are no reports of naturalisation in Australia. It is available through the Queensland retail nursery trade (Lawson 1997) and is being promoted through organic and permaculture groups. In Darwin, it has been promoted as a street tree (Hearne 1975).

Toxicological studies are required to determine the effects of *A. indica* extracts and products on native wildlife. Commercial plantations in the Gilbert and Mareeba area of Queensland have created a great deal of commercial interest. There is concern over the plant's potential impact on native insect populations (Lonsdale *pers. comm.*). There is also evidence that extracts from *A. indica* can affect certain aquatic life including fish and tadpoles (Anon. 1992).

Buddleja davidii
Franchet

butterfly bush,
summer lilac

Family: Loganiaceae

Buddleja davidii is a spreading shrub that is a popular garden ornamental because of its attractive spikes of sweetly scented lilac flowers. There are numerous cultivars available with flower colour ranging from deep purple to white (Ellison 1995). It is widely grown in eastern Australia in public and private gardens. It is pollinated by butterflies and is a popular nectar plant for butterflies in Europe and North America. The leaves are long, acuminate and velvety underneath. It flourishes in full sun and grows rapidly in the first 10 years (up to 0.5m per year) (Smale 1990). It is tolerant to most soil types but does not tolerate water-logged soils.

B. davidii is a weed of major importance in New Zealand (Timmins in Johnston 1990). Holm *et al.* (1979) recorded the related species, *B. asiatica* Lour., as a weed in Hawaii and the Philippines but did not record *B. davidii*. *B. davidii* is native to the highlands of west and central China. It is recorded in both the southern Lofty region of South Australia and in Victoria (Hnatiuk 1990). In Victoria, it has naturalised and exists as small populations. Numerous cultivars are available from nurseries (Lawson 1996).

Although there are five species of *Buddleja* naturalised in New Zealand only *B. davidii* is considered a major management problem (Johnston 1990). It is naturalised on both the North and South Island of New Zealand and has invaded streambeds, roadsides and land slips (Smale 1990). Seedlings can occur at densities of several million plants per hectare but will self-thin to populations of about 2 500 plants per hectare by 10 years of age. In New Zealand, it appears to be a pioneer species and is eventually replaced by native species if disturbance is not continuous (Smale 1990).

In Australia, *Buddleja davidii* has not reached its full potential and represents a threat to many vegetation communities (Blood *pers. comm.*). Damp sclerophyll forests are particularly vulnerable (Carr *et al.* 1992). Riparian communities also support infestations, particularly in association with disturbance in the urban area.

Calepina
***irregularis* (**
Asso.) Thell.

Syn. *C. corvini* Desv.,
Myagrum irregulare Asso.

white ball mustard

Family: Brassicaceae

An annual (possibly sometimes a facultative perennial) to 80cm tall, completely glabrous, often slightly glaucous; stems ascending or decumbent, branched from the base; flowers white (Cooke 1987, Ball 1964). It is native to Europe (Cooke *pers. comm.*). Holm *et al.* (1979) listed this species as a weed in Portugal and Italy (where it is a minor weed of agriculture). A naturalised population exists near Yorketown (South Australia). It was first noticed around 1979 (Cooke *pers. comm.*). It inhabits poor crop and degraded grazing land (Cooke *pers. comm.*).

***Callitriche
stagnalis* Scop.**

water starwort

Family: Callitrichaceae

Callitriche stagnalis is a submerged freshwater herb with stems up to 90 cm long (Swarbrick and Skarratt 1992). Reproduction occurs from seeds and stem fragments (Swarbrick and Skarratt 1994). *C. stagnalis* is native to the Mediterranean and north Africa (Carr *et al.* 1992). It has been recorded as a weed in Belgium and England (Holm *et al.* 1979). It exists in all States of Australia, except the Northern Territory, and is most common in New South Wales (Hnatiuk 1990) and Victoria (Carr *et al.* 1992). In Victoria, it inhabits riparian vegetation, freshwater wetlands, warm and cool temperate rainforest (Carr *et al.* 1992).

***Calopogonium
mucunoides* Dow.**

calopo

Family: Fabaceae

Calopogonium mucunoides is an annual vine with stems covered with yellow hairs. It produces pea-shaped, bluish-purple flowers that have yellow-green centres. The leaves are densely pubescent and pinnately trifoliolate (Smith 1995). The densely pubescent pods usually contain 5-7 seeds and dehisce when mature to expel the seeds.

C. mucunoides is used as a pasture species or green manure crop, despite its low palatability (Wesley-Smith 1992 in Smith 1995). It is native to tropical America and has been listed as a weed in the Philippines, Malaysia and Indonesia (Holm *et al.* 1979). Most naturalised populations exist in areas with tropical and sub-tropical climates.

In Australia, it exists in the Darwin and Gulf regions of the Northern Territory and in Cape York (Hnatiuk 1990). Cowie and Werner (1987) in Lonsdale (1994) reported that it has become a weed in Kakadu National Park. It is common in the Darwin region and surrounding bushland, where it forms dense mats that smother native vegetation' (Smith 1995).

Calotropis gigantea
(L.) R. Br.

Family: Asclepiadaceae

Calotropis gigantea is a shrub which grows to 5m tall. Flowers are produced throughout the year (Anon 1996). In Thailand, it has been investigated for use as a textile fibre plant by exploiting the fibre that surrounds the seeds in the pod (Tuntawiroon *et al.* 1984). In India, there are numerous medicinal uses recorded for various plant parts (Singh 1995).

C.gigantea is recorded in the weed flora of India (Holm *et al.* 1979) and as a weed in Thailand (Tuntawiroon *et al.* 1984). It occurs in tropical Africa, India, China and South-east Asia, in the woods of dry areas, along stream banks to elevations of 1400m (Anon 1996). Tuntawiroon *et al.* (1984) reported that the plant grows in all parts of Thailand as well as deforested areas, coastal margins and roadsides throughout South-east Asia.

Wilson (*pers. comm.*) reported that the plant is very common in Timor and that it has been found on Nhulunbuy and in some Darwin gardens. It is recorded as naturalised in the far north of Queensland around Cape York (Hnatiuk 1990) and is widespread on the Torres Strait islands. In Western Australia, it has escaped from gardens in Broome.

C gigantea may have the potential to cause problems comparable to *Ca procera* which is a noxious weed in the Northern Territory and Western Australia. In South-east Asia, *C. gigantea* occupies a wide range of disturbed areas including coastal systems. In tropical regions of northern Australia, it has potential to invade degraded rangeland pastures and coastal dunes. In the Northern Territory, eradication appears feasible as it is only known to exist as isolated individuals or as cultivated plants in Darwin. Eradication of scattered populations over vast, remote areas of Cape York, however, is very unlikely.

Cardaria draba
(L.) Dew.

hoary cress, white weed

Family: Brassicaceae

This species is a deep-rooted perennial plant, c. 70 cm tall. It has blue-green, lance-shaped leaves. The upper leaves are sessile (Whitson 1991). Profuse white flowers give the plant a 'flat-topped' appearance. It reproduces from small, reddish-brown seeds.

C. draba is a weed in Afghanistan, Hungary, Italy, the Soviet Union, the United States and several other countries (Holm *et al.* 1979). In the United States, it is common on disturbed sites, especially on alkaline soils where it can be very competitive (Whitson 1991). It is recorded to occur in all States of Australia, being particularly widespread in Victoria, South Australia and New South Wales (Hnatiuk 1990).

***Cassia alata* L.**

Syn. *Herpetica alata* Rafin.,
Senna alata

candle bush

Family: Caesalpiaceae

A short-lived shrub to c. 4m tall (Smith 1995) with thick, pithy stems and bright yellow flowers. The leaves are pinnate with 8-11 pairs of large, oblong leaflets (Smith 1995). The pods are winged and can be dispersed by water and animals (Parsons and Cuthbertson 1992). Since most seeds fall close to the parent plants, thicket formation tends to be common (Smith 1995). It can sucker from root buds if the plant is damaged (Parsons and Cuthbertson 1992). The seeds have a prolonged dormancy (Swarbrick and Skarrat 1994) and most germination occurs during the wet season. The plant prefers open positions (full sunlight), heavy soils and a humid/sub-humid tropical climate (Parsons and Cuthbertson 1992). It is grown as a garden ornamental and as an indoor plant.

C. alata is native to South America (Parsons and Cuthbertson 1992) and has been recorded as a weed in Ghana, Nigeria, Cambodia, Puerto Rico, Indonesia (Holm *et al.* 1979) and the Solomon Islands (Anon. undated). It has naturalised in Queensland and the Northern Territory, where it exists as isolated infestations over a large area. It is declared noxious in the Northern Territory (Parsons and Cuthbertson 1992) where it has formed dense thickets in disturbed/overgrazed areas and riparian habitats in coastal and sub-coastal regions (Smith 1995). It is particularly aggressive in areas where there is a high water table.

***Catharanthus roseus* (L.) G. Don**

Syn. *Vinca rosea* L.

vinca, pink periwinkle

Family: Apocynaceae

Catharanthus roseus is a small (c. 60cm tall), sprawling shrub that reproduces from seed. It has shiny, dark green leaves with conspicuous venation. The flowers are usually bright pink and occasionally white or purple. The pods are very slender (c. 3 mm wide and 2.5 mm long). The plant prefers sandy soils and is often associated with coastal dune systems.

C. roseus is native to Madagascar (Swarbrick and Skarratt 1994) and has been listed as a weed in Hawaii, the Dominican Republic and Fiji (Holm *et al.* 1979). It is grown in Australian gardens and has become widespread throughout tropical and sub-tropical regions, from the north coast of New South Wales north to the Pilbara in Western Australia (Hnatiuk 1990). It is common on the off shore islands along the Queensland coast (Swarbrick and Skarratt 1994, March *pers. comm.*) and has the potential to become more abundant in coastal dune, sand plain and riparian vegetation in tropical and subtropical areas.

***Celtis
occidentalis* L.**

hackberry, sugarberry

Family: Ulmaceae

A deciduous tree (c. 25m tall) (Bodkin 1991). The leaves are large, strongly asymmetric with sharply serrated margins (Harden 1990). It produces insignificant flowers and purple or nearly black drupes (Harden 1990). Propagation is by seed. It is frost resistant but drought sensitive.

C. occidentalis is native to North America (Bodkin 1991) and has been listed as a weed in the United States and Chile (Holm *et al.* 1979). In Australia, it is grown as a garden ornamental and has naturalised on the Darling Downs (south-east Queensland) and on the central coast of New South Wales (Hnatiuk 1990). It occurs most commonly along river banks (Harden 1990).

***Celtis sinensis*
Pers.**

celtis, Chinese elm

Family: Ulmaceae

Celtis sinensis is a deciduous tree (up to c. 12m tall), native to eastern Asia (China, Korea, and Japan). It flowers in spring and produces thousands of small, orange berries that are dispersed by birds (fruit bats, brush-tail possums and ringtail possums have been observed to visit fruiting specimens in Brisbane and may also disperse seed). *C. sinensis* appears to favour clay soils associated with alluvial creek-flats and gullies, especially riparian habitats and other open areas where the original forest has been cleared or disturbed. *C. celtis* is erroneously referred to as 'Chinese elm', however, the true Chinese elm is not known to be weedy.

Holm *et al.* (1979) listed the plant as a weed in Chile and the United States, but there is no information available on its overseas impact. The plant has naturalised throughout most of south-east Queensland, where it has formed dense infestations along creek-banks. At some locations near Ipswich (30km west of Brisbane) it appears to be preventing regeneration of riparian vegetation. Thick growth of *C. sinensis* and the associated loss of native vegetation might lead to reductions in the populations of certain native animals. The plant's response to bushfire is unknown. *C. sinensis* is widely cultivated as a garden plant/shade tree and is very common in the suburbs of Brisbane.

***Cestrum parqui* L'**
Herit

**green cestrum,
willow jasmine**

Family: Solanaceae

Cestrum parqui is a long-lived shrub (1-3m tall) with glabrous, narrowly lanceolate leaves that emit an unpleasant odour when crushed (Parsons and Cuthbertson 1992). The flowers are greenish-yellow, tubular and arranged in loose terminal clusters. Fruit are purple-black berries that each contain 1-2 seeds. Reproduction occurs from seeds that are dispersed by birds or flood water (Parsons and Cuthbertson 1992, Swarbrick and Skarratt 1994). Growth tends to be most vigorous in open positions in fertile, well-drained soils.

C. parqui is native to Central America (Swarbrick and Skarratt 1994) and has been recorded as a weed in Argentina, Chile, New Zealand, Uruguay and the United States (Holm *et al.* 1979). It is widely naturalised in the Northern Territory, South Australia, Victoria, Queensland and New South Wales. Due to its ability to invade agricultural land, it is declared noxious in Queensland, New South Wales and Victoria (Parsons and Cuthbertson 1992). In some areas of south-east Queensland, it has formed reasonably dense infestations along degraded creek-banks, particularly in areas, grazed and damaged by cattle. This plant may be an opportunistic weed of degraded grazing land rather than a significant weed of bushland.

***Chrysanthemoides
monilifera* (L.)
Norlindh**

ssp. rotundata (DC.) Norlindh
ssp. monilifera (DC.) Norlindh

**bitou bush
boneseed**

Family: Asteraceae

Both subspecies of *Chrysanthemoides monilifera* are evergreen shrubs growing to about 2m tall. They produce clusters of yellow daisy-like flowers and green berries that turn black when ripe. Reproduction occurs from seeds which are dispersed by birds (Dodkin and Gilmore 1985), rabbits, foxes, cattle and ants. Both subspecies prefer sandy or medium-textured soils, usually in disturbed situations (Parsons and Cuthbertson 1992). They are well adapted to fire and regenerate rapidly from soil seed banks after burning. Seeds can remain dormant for up to 10 years (Parsons and Cuthbertson 1992).

C. monilifera is native to South Africa (temperate and sub-tropical, summer-rainfall climates) (Wells *et al.* 1986) and is considered to be a weed in South Africa due to its impact in forestry plantations and native pastures. It is declared noxious in all States of Australia, except Tasmania and the Northern Territory (Parsons and Cuthbertson 1992).

The two sub-species naturalised in Australia are described below: *a*)

***ssp. rotundata* (DC.) Norlindh**

Distinguished from *ssp. monilifera* by its rounded leaves and shorter, sprawling habit (Parsons and Cuthbertson 1992). Naturalised in coastal dune vegetation along most of the New South Wales coastline. At some locations it has formed dense, almost monospecific stands that appear to suppress native understorey species and prevent recruitment of native shrubs and trees such

as *Acacia longifolia*, *Correa alba* and *Leucopogon parviflorus*. Particularly dense infestations occur on former sand mining leases, where the plant was deliberately planted to stabilise bare sand (Plate 21). It is potentially a serious weed in Victoria where it exists as small, localised populations in the You Yangs woodlands and grasslands (Carr *et al.* 1992). It exists in Tasmania and South Australia (Swarbrick and Skarratt 1994). Small naturalised populations in south-east Queensland (on Fraser Island, Rainbow Beach, South Stradbroke Island and on the Gold Coast) have been the subjects of an intense eradication program over the past 10-15 years. The plant is now rare in Queensland.

b) ssp. *monilifera* (DC.) Norlindh

An erect shrub which flowers mostly in late winter and early spring. Widespread in Victoria, Tasmania and south-eastern South Australia. Scattered infestations in south-western Western Australia (Swarbrick and Skarratt 1994). A strong competitor in many vegetation communities, including dry, coastal vegetation, heathlands, mallee shrublands, grasslands, woodlands, dry and damp sclerophyll forests, riparian vegetation and rocky outcrops (Carr *et al.* 1992). Many native species, including the native orchid, *Pterostylis truncata*, may be lost from areas that are dominated by the plant.

For both subspecies, nation-wide eradication is not feasible. Strategic control (using herbicides), fire management and biological control represent the most promising forms of management.

***Clematis vitalba* L.**

**old man's beard,
traveller's joy**

Family: Ranunculaceae

Clematis vitalba is a deciduous, woody, climbing plant native to Europe. Under favourable conditions, it can grow to a height of 26m and can smother nearby vegetation. Flowering occurs in summer and is followed by production of conspicuous, white, fluffy seed heads that persist into winter. The seeds are dispersed by wind, water and animals (Greer and Sheppard 1990).

In New Zealand, *C. vitalba* has been listed in the 'top ten weeds of importance' and is a major management problem in National Parks and reserves (Johnston 1990). It has been gazetted as a noxious weed (class B) in 33 local authorities and is found throughout New Zealand. It generally grows along river systems (Hume *et al.* 1995), forest margins, in urban areas and remnant bushlands (Johnston 1990). It has destroyed native vegetation by dominating the canopy and restricting light penetration to lower levels. Initially, the plant colonises forest edges or gaps, where there is plenty of light, and gradually moves towards the centre of forests as the outer trees fall over under the plant's weight. In the United Kingdom, it has been recorded to smother hedges (Brooks 1975, in Britt 1994).

In Australia, *C. vitalba* has naturalised in Hobart (Hnatiuk 1990), the southern Lofty region of South Australia (Hosking *pers. comm.*), Victoria (Carr *et al.* 1992) and Tasmania (Buchanan *pers. comm.*). Carr *et al.* (1992) listed *C. vitalba* as a threat to dry, coastal vegetation and grassy woodlands of temperate Australia. Eradication is not considered feasible in Tasmania, but may be feasible on the mainland since most existing populations are small.

Attempted chemical control of *C. vitalba* tends to damage the surrounding vegetation. Mechanical control is often impractical since much of the foliage is high in the canopy (Johnston 1990). Landcare groups in New Zealand are now trying to control the plant using cutting, burning and chemical techniques (Keltie 1995). Painting the cut stump with glyphosate appears to provide effective control but trimming alone has no effect (Britt 1994). In areas where access is difficult, whole infestations have been sprayed (even from helicopter) in summer, and this increases the risk of damage to indigenous vegetation (Greer and Sheppard 1990). In 1989, weed control authorities in New Zealand had spent over (NZ)\$750,000 to control *C. vitalba*.

***Coreopsis lanceolata* L.**

tickseed

Family: Asteraceae

An erect annual or short-lived perennial herb (c. 1 m tall). Produces yellow flowers on long, leafless stalks. Seeds c. 2-3 mm long, black and wind-dispersed (Kleinschmidt and Johnson 1987). Can also reproduce from rhizomes. Origin uncertain but may be native to either South Africa (Wells *et al.* 1986) or the United States (Swarbrick and Skarratt 1994). Occurs as a weed of agricultural land and wasteland in South Africa (Wells *et al.* 1986). In Australia, it has been recorded at the Blue Mountains (New South Wales) and in the south-west of Western Australia (Hnatiuk 1990). It is a weed of waste areas and roadsides in Queensland, where it exists in the Moreton district, around Stanthorpe and Girraween National Park (Kleinschmidt and Johnson

1987).

***Cortaderia selloana* (Schultes & J.H. Schultes) Asch. & Graebner**

pampas grass, silver pampas grass

Family: Poaceae

A dense, tussocky perennial grass that grows to 3m tall. It is widely grown in 'gardens for its large, plume-like, silky, white panicle borne on an erect reed-like stem up to 1m long (Harden 1993). The leaves are long, linear and tightly sheathed at the base. Reproduction occurs from wind-blown seeds (Swarbrick and Skarratt 1994). It prefers an open position in full sunlight (Bodkin 1992). It is native to Brazil and Argentina (Bodkin 1992) and has become a significant environmental weed in New Zealand.

In Australia, it exists in all States except the Northern Territory (Harden 1993) and is particularly common throughout the more temperate, winter-rainfall areas from south-east Queensland south to Tasmania and west to south-west Western Australia (Swarbrick and Skarratt 1994, Hnatiuk 1990). It has naturalised in several vegetation communities including dry coastal plains, heathlands, riparian areas, wetlands, tuart forests, eucalyptus forests and less frequently in grasslands (Swarbrick and Skarratt 1994). It prefers moist areas (Harradine 1991). There are numerous *Cortaderia* taxa within the nursery trade. Three species, *C. jubata*, *C. richardii* and *C. selloana* have naturalised in Australia and are considered to have significant weed potential (Harradine 1991). All species can compete with native plant species, alter fire regimes and reduce an area's conservation value.

Crataegus spp.

Crataegus eras-galle L..
C. monogyna Jacq..
C. oxycantha L.

hawthorn

Family: Rosaceae

The *Crataegus* genus contains many weedy ornamental species. In Australia, they have been widely planted as street trees and for hedges and have become naturalised in pastures and along roadsides. Spread occurs via bird-dispersed berries. The distribution of *Crataegus* species in Australia is increasing (Parsons and Cuthbertson 1992).

a) Crataegus crus galli L.

cockspurthorn

- *crus galli* is a deciduous shrub (to c. 5 m tall) with erect, slender, branching stems. The leaves are rounded with serrate margins. The flowers are pinkish-white. The fruit are deep red, glossy berries (Bodkin 1992). It is native to North America (Bodkin 1992) and is listed as a weed in the United States (Holm *et al.* 1979). This species was not recorded by Hnatiuk (1990) but has been listed in the ACT as having a restricted distribution with a moderate to high potential environmental weed score (Berry and Mulvaney 1995).

b) Crataegus monogyna Jacq.

hawthorn,

English hawthorn

- *monogyna* is a tall (to c. 8m) deciduous shrub with deeply lobed leaves and red/pink flowers. It produces red berries that each contain a single seed. Numerous hybrids and cultivars have been developed by the nursery trade. The plant is propagated from seed and prefers full sunlight. It is drought tolerant and frost resistant (Bodkin 1992). *C. monogyna* is native to Europe (Swarbrick and Skarratt 1994). In Australia, it has naturalised from south-east Queensland to south-east South Australia, including Tasmania (Hnatiuk 1990, Swarbrick and Skarratt 1994). It is a noxious weed in Victoria and South Australia (Parsons and Cuthbertson 1992).

c) Crataegus oxycantha L.

hawthorn

- *oxycantha* is a deciduous shrub (to c. 5m tall) with thorny branches. The leaves are glossy green and trilobed with irregular serrate margins (Bodkin 1995). The flowers are white and appear as a five-flowered corymb. The bright red berries contain three seeds (Bodkin 1992). It is native to Europe, North Africa and Western Asia (Bodkin 1992) and has been listed as a weed in Turkey (Holm *et al.* 1979). It has naturalised on the Darling Downs in Queensland (Hnatiuk 1990) and is listed as a potential environmental weed with a restricted distribution in the ACT (Berry and Mulvaney 1995).

Cuscuta planiflora
Ten.

dodder

Family: Cuscutaceae

Cuscuta planiflora is an annual herb which parasitises a large variety of host plants. The leaves are inconspicuous and the plant has the appearance of a mass of tangled stems. The flowers are white, cream or pink, bell-shaped and occur in clusters (Parsons and Cuthbertson 1992).

It is a weed throughout temperate regions of the world (Holm *et al.* 1979). In Australia, the genus is classed 'noxious' in New South Wales, Victoria and Tasmania. *C. planiflora* is also declared noxious in South Australia (Parsons and Cuthbertson 1992).

C. planiflora probably originates from the Mediterranean (Carr *et al.* 1992). Historically, there has been confusion regarding the identification of *Cuscuta* species in Australia as some species are native and others exotic. In Victoria, it exists as medium to large populations of limited distribution and is a potential threat to grassy woodlands, freshwater wetlands and subsaline wetlands (Carr *et al.* 1992). Naturalised populations also exist in Western Australia (unknown region) and the south-eastern region of South Australia (Hnatiuk 1990).

Cytisus scoparius
L. Link

*Syn. Sarothamnus
scoparius (L.) Wimm.*

**Scotch broom,
English broom**

Family: Fabaceae

A perennial shrub or small tree growing to 3m tall. The leaves are slightly pubescent, trifoliate and are shed during summer (Parsons and Cuthbertson 1992). Flowers are yellow, pea-shaped and occur in the leaf axils (Bodkin 1992). It produces flattened pods that contain yellowish-brown seeds. The pods dehisce on hot days to expel the seeds (Parsons and Cuthbertson 1992). Seeds establish readily on disturbed areas (Parsons and Cuthbertson 1992). Growth tends to be most prolific in neutral to slightly acidic soil in open areas (Parsons and Cuthbertson 1992). It is drought and frost resistant (Bodkin 1992).

C. scoparius is native to Europe and Asia (Wells *et al.* 1986) and is recorded as a weed in New Zealand, Hawaii, Iran, the United States, India (Holm *et al.* 1979) and South Africa (Wells *et al.* 1986). In South Africa, it is a weed of wastelands and pastoral areas where it competes with native vegetation (Wells *et al.* 1986).

It is widely grown as a garden ornamental in Australia and has naturalised throughout the south-eastern States, including Tasmania (Hnatiuk 1990). It competes with native shrubs and other understorey vegetation in wet and dry sclerophyll forests/woodlands, grasslands and alpine heath (Carr *et al.* 1992). It tends to be rare at undisturbed sites or pastures unless there is some soil disturbance. Once established at a disturbed site, however, it can rapidly dominate the area and prevent recruitment of native flora. It is very flammable and can change the fire regime of an area. It is declared noxious in New South Wales, Victoria, Tasmania and South Australia and continues to spread into new areas (Parsons and Cuthbertson 1992). Sold by nurseries in some States (eg. Queensland).

Delairea odorata
Lam.

Syn. *Senecio mikanoides*
Otto ex Walp.

cape ivy

Family: Asteraceae

Delairea odorata is a perennial, bushy vine that can cover vegetation to a considerable height and spread over several square metres (Lamp and Collet 1976). The leaves are leathery, fleshy, lobed and generally cordate-hastate. The stems are green or purple. In spring, the plant becomes covered with yellow flowers. The seeds can be spread by wind but it is more likely to spread vegetatively (Carr *et al.* 1992).

D. odorata is native to South Africa (Bodkin 1986) and has been recorded as a weed in Hawaii, New Zealand and the USA (Holm *et al.* 1979). It is widely naturalised, and present in all States of Australia except the Northern Territory (Hnatiuk 1990). It is particularly widespread in Victoria (Hnatiuk 1990) where it is a very serious threat to a number of vegetation types ranging from dry coastal vegetation to riparian communities and sclerophyll forests (Carr *et al.* 1992). In these areas it smothers native vegetation in the low shrub and grass/forb levels of the understorey. It is currently available from some nurseries.

Digitalis
***purpurea* L.**

foxglove

Family: Scrophulariaceae

Digitalis purpurea is an erect biennial or perennial herb planted extensively as an ornamental in flower beds, particularly in the "cottage garden" style. It grows to about 150 cm high and is densely hairy with glandular and non-glandular hairs on vegetative parts (Harden 1992). The basal leaves are ovate and form a rosette (Bodkin 1992). The inflorescence is a terminal raceme with all the flowers hanging on one side of the spike. The tubular bell-shaped flowers are white, purple or pink with mottled patterns. It is propagated from seeds which are probably dispersed by wind or water (Carr *et al.* 1992). It is frost resistant, drought sensitive and prefers moist soils in open positions (Bodkin 1992).

D. purpurea is a native to Britain and Europe (Bodkin 1992) and has been listed as a weed in Spain, Brazil, Chile, New Zealand, Turkey and the United States (Holm *et al.* 1979). It has naturalised from the central coast of New South Wales to southern and eastern Victoria and throughout many regions of Tasmania (Hnatiuk 1990). In Victoria, it has invaded moist and wet sclerophyll forest, riparian areas and rainforest (Carr *et al.* 1992). Infestations also exist in alpine areas (Swarbrick and Skarratt 1994). Nurseries continue to sell seedlings and seeds.

***Digitaria decumbens* Stent**

Syn. *Digitaria eriantha*
Steudel.
ssp. pentzii (Stent) Kok.

pangola grass

Family: Poaceae

Digitaria decumbens is a semi-erect perennial grass (to c. 1m tall). It will grow in a range of soils and tolerates drought and high soil acidity. It does not tolerate prolonged waterlogging or alkaline conditions. Growth is most prolific in moist, fertile, well drained soil in areas where annual rainfall exceeds 800mm (Anon 1997a). Reproduction occurs from seeds and rhizomes (Wells *et al.* 1986).

D. decumbens is used as pasture species but has poor nutritional value after the stems have elongated (Anon 1997a). It is recommended in pasture mixes to control weeds, such as *Hyptis capitata*, *Sida acuta* and *Cassia obtusifolia* in degraded pastures (Parsons and Cuthbertson 1992).

D. decumbens is native to the Americas and occurs from the United States through Central America and the West Indies to tropical South America (Anon. 1997b). It is listed as a weed in Hawaii, the Dominican Republic, Trinidad, the United States and Venezuela (Holm *et al.* 1979). It is also widespread throughout southern Africa where it occurs as a weed of wasteland and agriculture in a wide range of climates. In Australia it is widespread throughout Queensland (Hnatiuk 1990) and occurs as a pasture grass in northern Western Australia and the Northern Territory.

***Echinochloa polystachya* (Kunth) Hitchc.**

Syn. *Pseudechinolaena polystachya* (H. B. K.) Stapf.,
Oplismenus polystachyus
Kunth.

**aleman grass,
carib grass**

Family: Poaceae

Echinochloa polystachya is an aquatic or semi-aquatic, perennial, stoloniferous grass c.1-2.5m tall (Smith 1995) capable of growing in water up to 2m deep (Anon. 1991). The leaves are flat, smooth, 20-60cm long and 1-1.5cm wide. Dispersal occurs when pieces of stems or roots are broken and carried by flood waters. The plant produces small numbers of seeds.

E. polystachya is used for grazing, silage and hay in Central America and is an important grass in Brazil, producing large yields of palatable fodder (Anon. 1997a). It was introduced into Queensland as a potential ponded pasture grass for use by the grazing industry.

The plant is native to tropical and sub-tropical countries from southern USA to northern Argentina where it forms dense swards in seasonal swamps, lake shores and along rivers (Smith 1995, Anon. 1997a). It is common in wet places in the West Indies (Michael 1989). *E. polystachya* is considered to be a weed within its native range: Argentina, Mexico, India and Hawaii (Holm *et al.* 1979). Its synonym, *P polystachya*, is listed as a weed of Mexico and Zaire (Holm *et al.* 1979). The plant grows in inundated and rain-fed ricefields in Java where it may suppress other plants (Michael 1989).

Although the plant has only naturalised over small areas in northern Queensland, it is capable of spreading over much of tropical northern Australia (monsoon zone and wet tropics region). It was listed by Michael (1989) as a high priority threat to northern Australia. The plant

currently exists at small trial planting sites in the Northern Territory and Western Australia (Smith 1995) but has not yet naturalised. Continued promotion as a desirable ponded-pasture plant will accelerate spread. The plant has the potential to form monospecific stands in seasonally wet and dry tropical wetlands, including floodplains, where it could smother native plants (Smith 1995). Humphries *et al.* (1991) listed *E. polystachya* as one of Australia's top environmental weeds and recommended urgent control action and a review of current planting policy. Although total eradication may no longer be feasible, action should be taken to prevent continued spread.

Eragrostis curvular
Nees.

African lovegrass

Family: Poaceae

Eragrostis curvular is a densely tufted perennial (c. 120cm tall) (Lamp *et al.* 1990). There are numerous agronomic types of this species and these can lead to confusion regarding the plant's correct identity. Additional cultivars are being developed for use by the grazing industry (Lamp *et al.* 1990). The plant was introduced into Australia as a potential pasture species but most varieties are unpalatable. It has also been used for soil conservation purposes (Lamp *et al.* 1990).

E. curvular is native to South Africa, where it occurs in semi-arid, sub-tropical grasslands and open scrublands on sandy soils (Parsons and Cuthbertson 1992). Holm *et al.* (1979) listed the plant as a weed in Lebanon. It has naturalised in all Australian states, including Tasmania (Hnatiuk 1990), and occurs mostly in the 400-700mm annual rainfall band from southern Queensland to Western Australia. It is considered to be a significant environmental weed in Western Australia (Keighery, in Humphries *et al.* 1991) and is common along roadsides in south-west Western Australia (Lamp *et al.* 1995). It is less common in central Australia and western New South Wales. In Victoria it is a declared plant and is common from east Gippsland to the Mallee, where it has invaded heathlands, woodlands and grasslands. Dispersal occurs when seed is transported as a contaminant of pasture fodder, mud (on vehicles) and road aggregates (Parsons and Cuthbertson 1992). The plant is too widespread to be eradicated.

***Erica arborea* L.**

tree heath

Family: Ericaceae

A shrub or small tree (c. 6-7m tall) with masses of small white flowers. Reproduction occurs from seeds which can be dispersed over short distances by wind. A well developed lignotuber enables the plant to produce abundant sprouts following bushfire (Mesleard and Lepart 1989).

EE arborea is native to the Mediterranean region and the east African mountains (Mesleard and Lepart 1989). Holm *et al.* (1979) listed the plant as a weed in New Zealand. It is also documented as a weed in Corsica (Mesleard and Lepart 1989).

Naturalised populations of *E. arborea* exist in South Australia, Tasmania and Victoria (Hnatiuk 1990). In Victoria, it exists as localised, small populations and is considered to represent a very serious threat to riparian vegetation over a much larger area (Carr *et al.* 1992). Buchanan (*pers. comm.*) considers the plant to be beyond eradication in Tasmania. Several other species within the genus may also have weed potential in temperate regions of Australia. Of concern are three species currently being cultivated for use in floriculture, viz. *E. baccans*, *EE melanthera* and *EE quadrangularis* (Robinson *pers. comm.*).

Erica lusitanica
Rud.

Spanish heath,
Portuguese heath

Family: Ericaceae

Erica lusitanica is a dense, fine-leaved, pyramidal, evergreen shrub to c. 3m tall. It produces numerous short, white or pink, bell-shaped flowers in winter. General growth and development occurs in winter, but the plant is frost-tender. It prefers well drained soils in open sunny positions and is drought resistant (Bodkin 1986). It is propagated from seeds which are produced in enormous quantities. Mather and Williams (1990) found that a branch 0.5m long in full flower may carry between 3500 and 5550 flowers with 80 to 100 seeds developing in each capsule. A single bush, 0.5m tall and 4-6 years old, can produce 9 000 000 seeds annually. Flowering begins when plants are about 3-4 years of age and specimens can live up to 30 years. Optimum germination rates occur under conditions of fluctuating temperatures in autumn or spring when moisture, light and low temperatures break dormancy. Soil under mature plants can contain up to 500 000 viable seeds per square metre and seeds can remain viable for more than four years (Mather and Williams 1990). Fire appears to create suitable conditions for germination and seedling establishment although not all seeds in the seed-bank germinate (Mather and Williams 1990).

This species is native to south-west Europe (Spain and Portugal). In New Zealand, it has displaced the indigenous Manuka (*Leptospermum scoparium*), perhaps due to a superior ability to survive fire, trampling, grazing and to produce epicormic shoots. It is widely distributed in the North Island and the northern and eastern South Island where it is most abundant in open, disturbed habitats and on infertile hill country pasture in areas with moderate to fairly high rainfall. It is unpalatable to stock (Mather and Williams 1990).

E. lusitanica has naturalised in all eastern Australian states including Tasmania (Hnatiuk 1990). Buchanan (Tasmanian herbarium, *pers. comm.*) suggests that the plant is too well established for feasible control. It is well established in the sclerophyll vegetation of the Adelaide Hills (South Australian herbarium). In New South Wales, it may be spreading in the Blue Mountains and is beyond feasible control (Hosking, *pers. comm.*). In Victoria, it is widespread and has invaded lowland grassland/grassy woodland, dry and wet sclerophyll woodland and forest and riparian vegetation (Carr *et al.* 1992).

***Erigeron
karvinskianus* DC.**

**Mexican daisy,
seaside daisy**

Family: Asteraceae

A herbaceous ground-cover native to Central and North America. It produces daisy-like flowers in terminal clusters. Flower colour varies from white to pink. It has been listed in the 'top ten' priority weeds of the La Reunion Islands, where it has formed dense infestations on cliff-faces (MacDonald *et al.* 1991). It is also a weed in New Zealand (Blood *pers. comm.*) and Jamaica (Holm *et al.* 1979).

E. karvinskianus has naturalised in the south west of Western Australia, South Australia, Victoria, Tasmania and New South Wales (Hnatiuk 1990). It is a very common garden plant in Victoria (Blood *pers. comm.*). Eradication is not considered feasible, due to the plant's broad distribution.

***Eriobotrya japonica* (
Thunb.) Lindley**

loquat, Japanese plum

Family: Rosaceae

An erect, evergreen shrub or tree (to c. 5m tall) cultivated for its fruit and as a garden ornamental. Produces white flowers arranged in terminal panicles. The fruit is sweet, orangeyellow and contains a large, brown seed (probably dispersed by birds).

It has been recorded as a weed in South Africa (in dry, summer-rainfall areas), where it competes with native vegetation (Wells *et al.* 1986). It has naturalised in dry sclerophyll forests in south-east Queensland and on the north coast of New South Wales. Garden specimens are believed to be common in most States.

***Eryngium
maritimum* L.**

sea holly XXXXXXXXXX

Family: Apiaceae

A perennial plant native to the Mediterranean region (Bodkin 1992). The stems are erect and up to 60cm long. The leaves are greyish-blue, stiff, leathery, with spiny margins similar to holly; basal leaves are tri-lobed and spiny whereas leaves on the stem are palmately lobed and conspicuously veined (Bodkin 1992). The inflorescence is a dense, globular head of blue flowers (Bodkin 1992). Propagation generally occurs from seeds, although the plant will grow from cuttings. Growth is most prolific on light, sandy, alkaline soils in open, sunny positions. This plant is well adapted to coastal dune systems.

It is recorded as a weed in Spain (Holm *et al.* 1979) and also occurs along the Irish coast (Anon 1997) and on relict sand plains of Gibraltar (Linares 1997). It has naturalised on the north and central New South Wales coast (Hnatiuk 1990).

***Euphorbia
maculata* L.**

spotted spurge

Family: Euphorbiaceae

An annual herb with red pubescent stems that exude a milky sap when cut. The leaves are pubescent, oblong, 1-3cm long and have irregularly toothed margins. There is a distinctive large purple spot on each leaf (Whitson *et al.* 1991). The leaves fold late in the day and open early in the morning. The flowers are small and white and the fruit is a three chambered capsule (Bararpour *et al.* 1994). Seed dormancy is known to occur.

Holm *et al.* (1979) listed the plant as a 'principal weed' in Mexico and a 'common weed' in Japan, Argentina and the United States. It is also present in the weed flora of New Zealand. *E. maculata* is native to North America.

A well-established infestation exists in the Adelaide suburb of Unley (Kloot 1:986). It can compete strongly with cotton but there are no reports of its weediness in other crops (Bararpour *et al.* 1994). The plant is generally associated with disturbance caused by urbanisation or agriculture and is unlikely to become a significant environmental weed. Kloot (1986) considers it to be an insignificant weed in Adelaide, where it was first recorded in 1983 (Hosking *pens. comm.*).

***Festuca rubra* L.**

red fescue

Family: Poaceae

Festuca rubra is a rhizomatous tufted perennial grass (Harden 1993). The long rhizomes form a loose, dense sward. Numerous subspecies are planted as lawns (Harden 1993, Lamp *et al.* 1990). It has been used in pastures but is of little value (Lamp *et al.* 1990).

F. rubra is native to Europe, Asia and North America (Swarbrick and Skarratt 1994) and is recorded as a weed in Finland (Holm *et al.* 1979) and New Zealand (Lamp *et al.* 1990). It is widespread across temperate Australia, particularly in association with areas of improved pasture and lawns of urban areas in the south east of Australia (South Australia, Victoria, Tasmania, New South Wales) and south-west Western Australia (Harden 1993, Hnatiuk 1990, Swarbrick and Skarratt 1994). In Victoria, it is widespread (medium to large populations) and is a threat to dry coastal vegetation, dry sclerophyll forest and woodland (Carr *et al.* 1992).

***Fuchsia
magellanica* Lam.**

Family: Onagraceae

Fuchsia magellanica is a nearly-hairless, upright or sprawling slender-stemmed shrub up to c. 1m. The leaves are c. 2.5cm long, normally with toothed margins and short petioles. The flowers have purplish petals and crimson calyces and occur singularly or in pairs on short stalks from the upper leaf axils (Everett 1981). Many cultivated fuchsias are hybrids of *F. magellanica*.

Holm *et al.* (1979) reported that *F. magellanica* is a common weed in Hawaii. MacDonald (1991) reported that on the island of La Reunion, *F. magellanica* is a locally important invasive species, although not widespread in the primary forests.

Hnatiuk (1990) listed *F. magellanica* and *F. magellanica* Lam. var. *macrostemma* (Ruiz Lopez and Pavon) Munz as naturalised plants in South Australia. *They* have been recorded at several localities in the Adelaide Hills (South Australian herbarium). In Victoria, the plant exists as rare, small populations in damp and wet sclerophyll forests and riparian vegetation (Cart *et al.* 1992).

Dense infestations in the La Reunion islands occur along paths and tracks, where the plant may form dense tangled thickets which shade out native understorey plants and alter the structure of the vegetation. MacDonald (1991) concluded that *F. magellanica* is quite capable of penetrating and transforming undisturbed high altitude forests. In south-east Australia, there is the potential for *F. magellanica* to expand its range and displace native vegetation, particularly in association with disturbance. Blood (*pers. comm.*) believes eradication of naturalised populations may be feasible, although the large number of cultivated specimens could be difficult to detect and remove.

***Gazania regens* (
L.) Gaertner**

coastal gazania

Family: Asteraceae

Gazania regens is a perennial herb with branched, decumbent stems and narrow-oblong leaves. The flowers are daisy-like, orange to deep yellow. Reproduction occurs from seeds. It is native to southern Africa (Harden 1992) and has naturalised on coastal sand dunes and along roadsides from southern Sydney to Gosford (central coast of New South Wales), on the Eyre Peninsular and southern Lofty region (South Australia) (Harden 1992) and in the Moreton region of south-east Queensland (Anon. 1993). There are a number of garden varieties.

***Genista linifolia* L.**

Syn. Cytisus linifolius (L.) Lam.,
Teline linifolia (L.) Webb & Berth.

**flax broom, flax
leaf broom**

Family: Fabaceae

Genista linifolia is an erect shrub (to c. 3m tall) that can form impenetrable thickets. The pale green leaves are narrow, alternate, stemless and hairy (especially the underside). The flowers are bright yellow, pea-shaped and occur in clusters at the ends of the branchlets (Parsons and Cuthbertson 1992). Each pod contains 2-3 seeds each.

This species is cultivated as a garden ornamental in Australia and has naturalised on disturbed areas in regions with a warm temperate climate, moderate rainfall and slightly acid soil (Parsons and Cuthbertson 1992). It is a noxious weed in Victoria, a weed of oak forest in Morocco and a problem plant in the drier regions of New Zealand (Parsons and Cuthbertson 1992). Five of the six species of *Genista* that occur in Australia have naturalised (Hnatiuk 1990). *G. linifolia* is native to the Mediterranean region (Carr *et al.* 1992) and was introduced into Australia in the late colonial period (Parsons and Cuthbertson 1992). It exists in the south-west of Western Australia, South Australia, New South Wales (Hnatiuk 1990) and Victoria (Carr *et al.* 1992). It has only naturalised in Victoria where it is common on the Mornington Peninsular, Bellarine Peninsular and the Western District (Parsons and Cuthbertson 1992). It is a very serious threat to numerous vegetation communities in Victoria where it has invaded dry coastal heathland, riparian vegetation, dry woodland and forests and damp sclerophyll forest (Carr *et al.* 1992). The dense clumps and hedge rows formed by *G. linifolia* exclude native vegetation and can provide habitat for feral animals.

***Genista monspessulana* (L.) L. Johnson**

Syn. Cytisus monspessulana L.,
Teline monspessulana L. K.
Koch.

**Montpellier broom,
cape broom, canary
broom**

Family: Fabaceae

Genista monspessulana is an erect evergreen shrub that grows to about 3m high (Parsons and Cuthbertson 1992). The flowers are bright yellow and pea-shaped, occurring at the ends of branchlets. Flowering usually occurs in late winter and spring. The leaves are short-stalked and pubescent on the underside. Each pod contains 6-7 black seeds. The pods dehisce with considerable force, scattering the seeds. The seeds can be dispersed by birds, animals and mud on vehicles. The seeds have a prolonged dormancy that is broken by fire (Swarbrick and Skarratt 1994). *G. monspessulana* has an extensive root system which allows it to withstand drought (Parsons and Cuthbertson 1992).

G. monspessulana is native to Europe and the Mediterranean. It has been recorded as a weed along the west coast of the United States, in Hawaii and in the higher rainfall areas of New Zealand, Chile and South Africa (Parsons and Cuthbertson 1992).

G. monspessulana is believed to have been introduced into Australia in the late colonial period. It has since naturalised in the higher rainfall areas of southern Australia, including Tasmania (Butanone 1995), New South Wales (Harden 1992), the south west of Western Australia

(Parsons and Cuthbertson 1992) and Victoria. In Victoria, it is common and widely naturalised in many vegetation communities including coastal heath communities, dry grasslands and woodlands, sclerophyll forests and rock outcrop vegetation (Carr *et al.* 1992). It has invaded several National Parks in both South Australia and Victoria and also occurs on wasteland, along roadsides, forest margins, watercourses and railway lines (Swarbrick and Skarratt 1994). It is considered to represent a very serious threat to native vegetation in Victoria and is still being sold by nurseries (Carr *et al.* 1992). Dense growth can exclude native vegetation and increase the frequency and intensity of fire. Dense thickets develop a large seed bank in the soil which germinates *en masse* following fire. The plant is declared noxious in Victoria, South Australia and Tasmania (Parsons and Cuthbertson 1994).

***Glechoma
hederacea* L.**

Syn. *Nepeta hederacea* (L.) Trev.

ground ivy

Family: Lamiaceae

Glechoma hederacea is a pubescent, perennial with a creeping habit similar to common ivy (*Hedera helix*). The plant produces bluish flowers in spring, although some flowering may occur throughout the year. The kidney-shaped leaves are green if the plant is shaded but may turn red when subjected to full sunlight. It has a bitter taste and is avoided by grazing animals. It is considered poisonous to horses (Muenscher 1948, in Mitich 1994).

G. hederacea has been recorded as a weed in north America, Japan, Russia, Germany, Finland and New Zealand (Holm *et al.* 1979). Under the synonym, *Nepeta hederacea*, it is listed as common weed of China and Canada (Holm *et al.* 1979).

G. hederacea is native to most of Europe but is now a familiar garden weed in north America. It has also been recorded in the arctic circle (Gerard 1928 in Mitich 1994). It was not included in the Census of Australian Vascular Plants (Hnatiuk 1990) but has been recorded by the Tasmanian Herbarium. Although the South Australian Herbarium has a record from near Adelaide, the identity of the specimen is not certain.

Climatically, *G. hederacea* appears best suited to humid and sub-humid temperate zones of southern Australia. Once firmly naturalised, the plant may have the potential to smother and replace native understorey species in temperate rainforests, wet sclerophyll forests and riparian habitats, particularly where gaps exist in the forest canopy. Eradication could be very difficult, if not impossible, due to the plant's habit and the presence of roots at every node.

***Gliricidia sepium* (Jacq.) Steud**

**madre de cacao,
mother of cacao**

Family: Fabaceae

Gliricidia sepium is a fast growing, nitrogen-fixing, tropical tree to about 12m in height. The leaves are pinnate and up to 30cm long. It is generally deciduous in the dry season. The dense inflorescences are comprised of many flowers. The flowers are usually bright pink with a white tinge and a yellow spot at the base of the standard petal (Glover 1989). The bark is smooth and whitish-grey. The fruits are flattened pods about 10-15 cm long and contain 4 - 10 seeds.

G. sepium tolerates a wide range of climatic and edaphic conditions. It propagates readily from seed or cuttings. Growth is most rapid in regions where annual rainfall exceeds 900mm, but it will grow where rainfall is as low as 400mm per annum (Glover 1989). It grows in soils ranging from heavy clays to sands and on rocky eroded sites, however, it is intolerant of waterlogging. The plant is used for fuel wood, animal feed, green manure, shade, poles, living fences and as support plants. It may have toxic effects on pigs and poultry and has been used as a rat poison (Glover 1989).

Holm *et al.* (1979) recorded *G. sepium* as a weed in Jamaica. It is native to the drier western regions of Mexico and Central America where it can grow as extensive, mono-specific thickets on sandy shorelines (Glover 1989). It is now found throughout the tropical and subtropical world. The Queensland Herbarium has recorded specimens from a large area of the State from Gayndah (south-east Queensland) to Cairns (far north Queensland). Mitchell (*pers. comm.*) reports naturalised populations on Koolan Island off the Kimberley coast and that it is common in established gardens of Broome in Western Australia. Cowie (*pers. comm.*) does not know of it in the Darwin area.

The climate of coastal northern Australia is similar to that within the natural range of *G. sepium*. With its ability to colonise a range of soil types it is possible that it could naturalise over large areas in coastal northern Australia. The plant is best suited to coastal and riparian habitats of the tropics and sub-tropics. In these areas, it could displace native vegetation and alter the soil nutrient regime (increase soil nitrogen), perhaps facilitating further invasion by other exotic plants.

***Gloriosa superba* L.**

glory lily, climbing lily

Family: Liliaceae

A herbaceous annual climber with subterranean, perennial, tubers (le Roux and Robbertse 1994). It is native to Africa and has been cultivated as a garden ornamental and in floriculture in many tropical and subtropical countries (Narain 1981). The flowers are red and yellow. It has some economic value due to its alkaloid colchicine content (Dvorackova *et al* 1984 in le Roux and Robbertse 1994). Colchicine is used in cell division research (Tootill 1984). Propagation generally occurs from seeds, although mature plants can be divided and grown from tubers. The hard seeds can remain dormant for 6-9 months (Narain 1977 in le Roux and Robbertse 1994).

This species is recorded as a weed in Nigeria (Africa) (Holm *et al.* 1979). Scattered naturalised populations exist in the **understorey** of coastal dry sclerophyll forest and sand dune vegetation throughout south-east Queensland and New South Wales. It was introduced into Victoria by the horticultural trade and specialist plant collectors (Blood *pers. comm.*). Despite being cultivated in gardens, naturalised specimens have not yet been recorded in the Northern Territory (Cowie *pers. comm.*).

***Glycyrrhiza glabra* L.**

Syn. *G. glandulifera* W. & K.

licorice

Family: Fabaceae

A rapidly growing perennial, leguminous shrub (to c. 1.5m tall) that propagates from seeds and vegetatively (Rakhmanina and Molotkovskii 1983). It is a hardy plant and tolerates a wide range of soil and water regimes, including saline soil and dry slopes. It has some commercial value in the food industry, in herbal medicine and to produce dyes and tannins.

It is native to southern Europe and central Asia (Everett 1981) and is listed as a weed in Turkey, Iran, Iraq and South Africa (Holm *et al.* 1979, Wells *et al.* 1986). Naturalised populations exist in California (Everett 1981) and on the karoo in South Africa (Hosking *pers. comm.*). In South Africa, the plant inhabits dry temperate regions and competes with native vegetation (Wells *et al.* 1986). It has naturalised in South Australia, Queensland, New South Wales and Victoria (Hnatiuk 1990). In South Australia, it is common in suburban areas and along roadsides (South Australian herbarium).

***Hedera helix* L.**

ivy, English ivy

Family: Araliaceae

Hedera helix is a woody, evergreen climber that may grow to a height of c. 20m. (Bodkin 1992). It is widely grown as an ornamental ground cover and to cover walls and fences. The glossy, dark green, leathery leaves are typically 5-pointed (Ellison 1995). Inconspicuous yellowishgreen flowers appear in autumn. It produces small black berries that are dispersed by birds. Numerous ornamental cultivars have been developed with a variety of leaf shapes and colours (Ellison 1995). The plant can be propagated from cuttings.

H. helix is native to central Europe (Bodkin 1992) and has been listed as a weed in the United States (Holm *et al.* 1979). It has been recognised as a serious environmental weed in several States of Australia, although it has not been declared noxious (Anon. undated, Berry and Mulvaney 1995, Carr *et al.* 1992). It has naturalised throughout southeastern Australia from the central and northern Tablelands of New South Wales to the southern Lofty region of South Australia (Swarbrick and Skarratt 1994). In Victoria, it has invaded dry and wet sclerophyll forests, woodlands, riparian vegetation, rocky outcrops and warm temperate rainforest (Carr *et al.* 1992). *H. helix* competes vigorously with native plant species and can dominate understorey vegetation and smother trees and shrubs.

***Hedychium coronarium* König.**

white ginger

Family: Zingiberaceae

Hedychium coronarium always grows in humus-rich, shaded or semi-shaded areas subject to seasonal or perennial water-logging (Joly and Brandle 1995). It can grow to 2m tall and produces a thick mat of rhizomes which creep laterally close to the soil surface. Large white perfumed flowers open at dusk.

Holm *et al.* (1979) reported the plant as a common weed of Peru. Two related and similar species, *H. gardnerianum* and *H. flavescens*, have become major environmental weeds in New Zealand (Byrne 1992).

H. coronarium is native to Eastern India and is now widespread in the neotropics and Europe (Joly and Brandle 1995). In Queensland, the plant has naturalised in the Moreton (south-east Queensland) and Cook (far north Queensland) regions (Hnatiuk 1990). It is widely available through nurseries in Queensland (Lawson 1996). It has not been collected in New South Wales (Mc Cone *pers. comm.*).

H. coronarium may have weed potential in sub-tropical and temperate regions of Australia, particularly in coastal wetland areas subject to seasonal flooding. Under favourable conditions, the plant could form extensive thickets which may suppress regeneration of native wetland plants. The plant's pest potential may be compatible to two closely related species, *H. gardnerianum* and *H. flavescens* which are both aggressive invaders of New Zealand's native forests. Eradication is not considered feasible due to the plant's widespread distribution and use in gardens.

***Heterotheca grandiflora* Nutt.**

telegraph weed

Family: Asteraceae

Heterotheca grandiflora is an erect annual herb growing up to 2m tall. It usually has a single stem, although some specimens may have several. The stems and leaves are pubescent. Yellow flowers are produced in late summer and the seeds are wind-borne. *H. grandiflora* is native to Central America and has been listed as a weed in Hawaii and the United States (Holm *et al.* 1979). It is widespread in California and has the potential to become widespread in Australia (Hosking *pers. comm.*). Naturalised populations exist around Newcastle in coastal New South Wales (Harden 1992). On the Gold Coast (south-east Queensland), it has become common along roadsides and tracks on coastal sand dunes and is probably beyond eradication. It is restricted to areas where most of the natural vegetation has been removed or severely damaged and its ability to invade and replace native vegetation appears limited.

***Hydrocotyle
bonariensis* Lam.**

Syn. *Hydrocotyle
umbellata* L.

**pennywort,
kurnell curse**

Family: Apiaceae

Hydrocotyle bonariensis is a rhizomatous perennial herb with stems that creep along the ground and take root at the nodes (Harden 1992). The leaves are circular with shallowly lobed margins (Harden 1992). The inflorescence is a compound umbel composed of many white and yellow flowers. It can survive prolonged inundation in fresh water (Sainty and Jacobs 1981).

H. bonariensis is native to South America (Harden 1992) and has been listed as a weed in Argentina, Peru, Brazil, Chile and Mauritius (Holm *et al.* 1979). Scattered naturalised populations exist from the Sydney area north to south-east Queensland. Small populations also occur in eastern Victoria, south-west Western Australia and on Lord Howe Island (Hnatiuk 1990, Swarbrick and Skarratt 1994). *H. bonariensis* has the potential to increase in abundance on coastal sand dunes and on the sandy soils on cliff faces, coastal riparian systems (subsaline wetlands) and lawns (Harden 1992, Carr *et al.* 1992). Sainty and Jacobs (1981) have suggested that it may be useful for stabilising coastal sands.

***Hydrocotyle
ranunculoides* L. f.**

water penny wort

Family: Apiaceae

A floating, aquatic herb which grows rooted to river banks. Spread occurs from stem fragments that produce roots at each node. It is native to North and South America (Everett 1981) and is a weed in Columbia (Holm *et al.* 1979). Naturalised populations exist in coastal, freshwater streams of Western Australia, where it is reported to have escaped from ornamental garden ponds (Keighery 1994). Dense growth can smother static or slowly flowing waterways, particularly in nutrient-rich waters. The first naturalised specimen in Australia was recorded in 1983 in Western Australia (Atkins 1994). A large infestation developed in a eutrophic section of the Canning River (Perth) between 1983 and 1992 (Atkins 1994). The plant was declared noxious in Western Australia in 1992 and is now the subject of an eradication program.

could be lost or reduced in numbers. The **tourism value** of areas such as Kakadu might exceed **the plant's** value as a pasture grass, especially when there is a highly palatable native hymenachne (*H. acutigluma*) available. Humphries *et al.* (1991) listed *H. amplexicaulis* as one of Australia's top environmental weeds and described the urgency for action as 'critical'.

***Hypericum androsaemum* L.**

amber, tutsan

Family: Clusiaceae

Hypericum androsaemum is an erect, branching, evergreen shrub (to c. 1m tall). The leaves are oval-shaped and have an aromatic smell when crushed. Flowers are bright yellow and arranged in terminal clusters. The fruit are black berries. *H. androsaemum* is a prolific seeder and can be propagated from seeds and cuttings. The plant prefers shaded sites and forest edges in regions where annual rainfall exceeds 750 mm (Parsons and Cuthbertson 1992).

H. androsaemum is considered to be native to Europe (Bodkin 1992, Carr *et al.* 1992), North Africa (Carr *et al.* 1992) and Asia (Carr *et al.* 1992, Swarbrick and Skarratt 1994). It has been listed as a weed in New Zealand (Holm *et al.* 1979).

Naturalised specimens can be found from the north and central coast of New South Wales, throughout most of Victoria, in Tasmania and south west Western Australia (Hnatiuk 1990, Swarbrick and Skarratt 1994). It represents a threat to damp and wet sclerophyll forests, warm and cool temperate rainforests and riparian vegetation communities (Carr *et al.* 1992) and has been declared noxious in Victoria (Parsons and Cuthbertson 1992).

***Hyptis pectinata* (L.) Poit.**

comb hyptis

Family: Lamiaceae

Hyptis pectinata is an erect herb up to 3m tall (Waterhouse *pers. comm.*). The stems are shallowly grooved, 4-angled and often woody at the base. The leaves are simple, opposite with crenate margins and pubescent undersides. Tiny white or purple flowers are arranged in dense, whorl-like clusters on axillary or terminal cymes (Whistler 1983). Prolific tiny seeds (< 1mm in diameter) are produced in small black nutlets. The seeds are probably transported long distances in mud on vehicles and machinery (Waterhouse *pers. comm.*) or by sticking to the fur of animals (Whistler 1983).

H. pectinata is a weed in Fiji, Hawaii, Puerto Rico and many other tropical countries (Holm *et al.* 1979). It is native to tropical America (Anon. 1981).

In Australia, there are only a few recordings of this species and all are in the Cairns and Daintree areas (Queensland herbarium). It is spreading in wetter areas (Waterhouse, *pers. comm.*) and is showing potential to be a serious weed in unmaintained orchards and pastures in tropical areas. Chemical control has been effective against large thickets in Fiji (Anon. 1981).

***Ipomoea alba* L.**

Syn. *I. bona-nox* L.,
Calonyction aculeatum House

moon flower

Family: Convolvulaceae

Ipomoea alba is an annual or perennial vine to 7m high with heart shaped leaves to c. 10cm diameter. The trumpet-shaped flowers are fragrant, white to greenish-white, and open at night. The flowers occur on long stalks of about 15cm in length (Everett 1981) in summer and autumn. Reproduction is via seed and by production of adventitious roots along prostrate stems (Swarbrick and Skarratt 1994). It is cultivated as an ornamental (Harden 1992) and grows in wet forests, watercourses and disturbed areas (Anon. 1996). Holm *et al.* (1979) recorded *I. alba* as a weed in Hawaii and West Polynesia.

I. alba is native to tropical America and occurs in southern Florida. Groves (1996) reported that it was first recorded as naturalised in Queensland in 1985 although it was first introduced in 1948. Naturalised populations exist in New South Wales in the Tweed River region (Harden 1992). It is available through the nursery trade in Queensland (Lawson 1996).

I. alba may have the potential to colonise the edges of rainforests and invade any gaps created within rainforest and wet sclerophyll forest. Considering the plant's distribution overseas, it may be well suited to sub-tropical and tropical, coastal areas of Queensland and northern New South Wales. Initial spread will probably occur in the vicinity of urban areas where the plant exists in gardens. Chemical control of *Ipomoea* species tends to be very difficult and often results in non-target damage to underlying vegetation.

***Ipomoea quamoclit* L.**

Syn. *Quamoclit pinnata*
(Desv.) Boj.

cypress vine,
morning glory, star
of Bethlehem

Family: Convolvulaceae

An annual, prostrate or twining vine with pinnate leaves (Lowell and Lucansky 1990). It can grow up to 7m tall when climbing through other vegetation. It has brilliant red (sometimes white) velvety flowers, c. 2cm diameter, often in pairs, on thin stalks arising from leaf axils and produces large numbers of seeds that germinate readily (Smith 1995). Although the plant's origin is uncertain, it is possibly native to eastern India (Smith 1995). It is recorded as a weed in Vietnam and the USA (Holm *et al.* 1979, Gilreath 1985) and was introduced into Australia as a garden ornamental. Naturalised populations exist in coastal regions of Queensland, the Northern Territory and Western Australia (Hnatiuk 1990, Smith 1995). In the Northern Territory, it has smothered native trees and shrubs and is becoming increasingly problematic around Darwin, where it has covered grass swards (Cowie *pers. comm.*). In Queensland, it is widely distributed in a number of habitats ranging from the fringes of mangroves to rainforest and eucalypt forest. It may have the potential to invade early successional stages of tropical monsoon vine thickets and compete with native vine species. There appears to be some success in limiting its spread by use of fire (Cowie *pers. comm.*).

***Iris pseudacorus* L.**

yellow flag iris

Family: Iridaceae

Iris pseudacorus is a water-loving plant of high fertility areas. It is associated with certain hydrological conditions, usually on waterlogged lower hill-slopes and valleys or wet valleys where ground-water seepage or springs are present (Mulqueen and Gleeson 1988).

Holm *et al.* (1979) recorded *I. pseudacorus* as a weed in Argentina, Iran, Portugal, Spain, New Zealand, United States, United Kingdom and Europe.

I. pseudacorus has naturalised in Victoria and Canberra (Blood *pers. comm.*). In Victoria, the plant is rare or localised, in medium to large populations, in riparian vegetation and permanent freshwater wetlands (Carr *et al.* 1992). It is available from nurseries in Victoria (Carr *et al.* 1992). *I. pseudacorus* may have the potential to form scattered populations in riparian vegetation and permanent freshwater wetlands over much of southern Australia.

***Jatropha gossypifolia* L.**

Syn. *Adenoropium gossypifolium* (L.) Pohl.

bellyache bush

Family: Euphorbiaceae

Jatropha gossypifolia is a shrub (to c. 3m tall) with palmate foliage and red buds. The flowers are small and clustered on stalks in the upper axils (Smith 1995). The capsules dehisce and eject seeds away from the parent plant. Mature bushes can produce large numbers of seeds and tend to quickly form thickets (Smith 1995). The seeds are dispersed by flowing water or in mud on vehicles.

J. gossypifolia is native to the Caribbean (Swarbrick and Skarratt 1994) and tropical America but is now widespread throughout the tropical world (Smith 1995). It has been listed as a weed in India, Brazil, Jamaica and Trinidad (Holm *et al.* 1979). Extensive naturalised populations exist in northern tropical Australia, including large infestations on grazing land near Charters Towers and in the Kimberley and Pilbara coastal regions (Hnatiuk 1990, Swarbrick and Skarratt 1994). Preferred habitats include savanna woodland, riparian areas, monsoon vine forests and coastal foreshores (Swarbrick and Skarratt 1994). It is often a weed of degraded pastures and disturbed river frontages and is commonly associated with old settlements (Smith 1995). It is a declared noxious weed in the Northern Territory.

***Juncus inflexus*' L.**

hard rush

Family: Juncaceae

Holm *et al.* (1979) recorded *Juncus inflexus* as a weed in Belgium and England. It is native to North Africa, Eurasia and India (Hosking *pers. comm.*). The plant was not listed by Hnatiuk (1990) and may be a recent introduction into Australia (Groves 1996). It exists in the Howqua Valley (Victoria) (recorded in 1985) and may invade wetlands and riparian vegetation in temperate regions of southern Australia. There is insufficient information in the literature to make further predictions of its weed potential.

***Lavandula stoechus* L.**

topped lavender, bush lavender

Family: Lamiaceae

Lavandula stoechus is an erect woody shrub growing up to 1m high. The inflorescence is a cylindrical head, topped with purple bracts that have a strong lavender perfume. The stems and leaves are hairy, giving the plant a greyish appearance. Seeds can remain viable for many years and are spread by machinery and water. It has been cultivated for the extraction of lavender oil.

L. stoechus is native to the Mediterranean region and south-west Europe (Bodkin 1992, Carr *et al.* 1992). It has been listed as a weed in Spain (Holm *et al.* 1979) and is naturalised in south-west Western Australia, south-east South Australia and from central Victoria to the central coastal area of New South Wales. In Victoria, it represents a serious threat to grassy woodlands, dry sclerophyll forests and woodlands (Carr *et al.* 1992). Dense growth can exclude native vegetation and harbour feral animals. It is a noxious weed in Victoria (Parsons and Cuthbertson 1992).

***Leonotis nepetifolia* R. Br.**

Syn. Phiomis nepetaefolia L.

lion's tail, lion's ear

Family: Lamiaceae

An erect annual herb that grows to 3m tall (Waterhouse *pers. comm.*). The stems are covered with short white hairs and are often grooved (Smith 1995). The leaves are opposite, with toothed edges and the inflorescence is a cluster or ball, surrounded by sharp pointed leafy bracts. The individual flowers are orange and hairy. It can form dense thickets and its seeds are dispersed by water and mud on machinery (Parsons and Cuthbertson 1992, Smith 1995).

L. nepetaefolia is native to tropical South America (Parsons and Cuthbertson 1992, Smith 1995) and has become a pan-tropical weed (Holm *et al.* 1979). Parsons and Cuthbertson (1992) reported that it is a serious weed of sugar cane and rice within its native range.

L. nepetaefolia is a noxious weed in the Northern Territory, where it can be found in the Darwin, Daly River and Victoria River areas (Smith 1995). It is also a weed in Queensland's Gulf country, on Cape York (Hnatiuk 1990) and around central Queensland (Parsons and Cuthbertson 1992). It does not occur in southern Australia. It is most abundant on heavily disturbed areas such as roadsides, overgrazed pastures and river levee banks (Smith 1995). It has the ability to develop large colonies that displace native plant species. Although widespread, it has the potential to increase its distribution and abundance and become a more serious weed (Parsons and Cuthbertson 1992).

***Leucaena
leucocephala***
(Lam.) De Wit.

Syn. *L. glauca* Benth.

leucaena

Family: Mimosaceae

Leucaena leucocephala is a small tree (to c. 6m tall) with bipinnate leaves, creamy yellow, spherical flowers and flattened seed pods. The plant reproduces from seeds. It has been planted extensively throughout tropical areas of the world to provide cattle fodder, shade, firewood and to stabilise bare soil. It is being promoted in tropical areas of Australia as a high protein fodder tree and is being grown under irrigation in feedlots and alley crop systems.

L. leucocephala is native to Central and South America (Smith 1995) and has been listed as a weed in New Guinea, Hawaii, Western Polynesia and the United States (Holm *et al.* 1979).

In Australia, *L. leucocephala* is common around Darwin and coastal settlements in the Northern Territory (Smith 1995). It has naturalised throughout settlements in the Kimberley, across the Gulf of Carpentaria and throughout coastal Queensland and into northern New South Wales (Hnatiuk 1990, Swarbrick and Skarratt 1994). It has also naturalised on a number of off-shore islands including St Helena in Moreton Bay, Norfolk Island and Nhulunbuy. It has formed dense thickets along some creek lines in north Queensland and may have suppressed the regeneration of native plant species.

***Ligustrum* spp.**

privet

***Ligustrum vulgare* L.**

common privet,
European privet

***Ligustrum sinense* Lour.**

Chinese privet, small leaf
privet

***Ligustrum lucidum* Aiton.**

tree privet, large leaf
privet

Family: Oleaceae

Ligustrum is a genus of about 50 species, mostly from Europe and Asia (Harden 1992). There are three naturalised species in Australia and one endemic species (Harden 1992, Hnatiuk 1990). All are shrubs or small trees with leathery, dark green, opposite leaves. The inflorescence is a terminal panicle of numerous small flowers. The fruits are black or blue-black berries with a waxy coat. Seeds are dispersed by frugiferous birds (Carr *et al.* 1992). Several species are grown as ornamental trees or shrubs, hedges or windbreaks under the name of 'Privet'. They are all suspected to have toxic properties (Everist 1974), cause hayfever (Auld and Medd 1987) and are all available through the nursery trade (Carr *et al.* 1992). Only one species, *L. lucidum*, is recorded as a weed overseas (in South Africa) (Wells *et al.* 1986).

L. vulgare is grown as a hedge plant in temperate Australia. It is deciduous or semi-deciduous and is native to southern Europe and North Africa (Harden 1992). It has panicles of strongly perfumed white-cream flowers (Harden 1992). Small naturalised populations exist in Victoria, where it poses a serious threat to grassy woodlands, riparian vegetation and rock outcrop vegetation (Carr *et al.* 1992). Naturalised populations also exist in the central and northern Tablelands of New South Wales, South Australia (Harden 1992) and Tasmania (Buchanan 1995).

L. lucidum is a densely branched tree up to 10 m (Swarbrick and Skarratt 1994) with broad, thick leathery leaves and profuse black berries (Auld and Medd 1987). It is commonly used as a windbreak in temperate areas and the subtropics (Everist 1974). It is native to Japan and China (Harden 1992). In South Africa, it is an environmental weed, occupying streambanks and dry and moist habitats of the summer rainfall (temperate and sub-tropical) regions of South Africa and Mozambique (Wells *et al.* 1986). Small naturalised populations exist in Victoria where it is a potential threat to grasslands, woodlands, riparian vegetation and dry or damp sclerophyll forest (Carr *et al.* 1992). In New South Wales, it is widespread in coastal regions from Bega to Queensland and inland to West Wyalong (Harden 1992). It is an invasive woody weed, especially in coastal rainforest (Harden 1992). It is widely distributed throughout south-east Queensland and can be found on the Atherton Tablelands (Swarbrick and Skarratt 1994).

L. sinense is a densely branched small tree or large shrub (up to 4m) with profuse panicles of heavily scented white flowers (Auld and Medd 1987, Harden 1992). It is native to China (Harden 1992). Large naturalised populations exist in Victoria, where it poses a threat to riparian vegetation (Carr *et al.* 1992). It is widely naturalised in New South Wales, especially on the margins of rainforest, along fencelines, north from Bredbo to south-east Queensland (Harden 1992). It is also a woody weed on Lord Howe Island (Harden 1992).

All three species are garden escapes. Lawson (1997) lists two new ornamental species that are available through the plant nursery industry. Little progress can be made towards controlling these species without restricting their continued sale and distribution.

***Linaria vulgaris* Hill**

toad flax

Family: Scrophulariaceae

A herbaceous perennial plant (c. 0.5-1.0m tall) native to Europe (Mitch, 1993). Spreads occurs from seeds and adventitious roots. The small winged seeds usually fall within 1.5m from the parent plant (Nadeau and King 1991). The inflorescence consists of spikes of yellow-orangetipped flowers that resemble snapdragons. The plant prefers sandy, gravelly soil in dry, open habitats (Mitch, 1993).

It is recorded as a weed in Canada, the United States, England, the Soviet Union, New Zealand and Italy (Holm *et al.* 1979) and is the subject of a biological control program in Canada (Hosking *pers. comm.*). Naturalised populations exist in North America, northern Africa, Scandinavia and Australia (Holm *et al.* 1979). It has naturalised in south-east Queensland (Darling Downs), New South Wales (Hosking *pers. comm.*) and Tasmania (Buchanan 1995). It is sold in "wildflower" seed mixes in Western Australia (Dodd *pers. comm.*). The plant prefers heavily disturbed sites such as cropping land, roadsides, fencelines or clearings under power lines and may not have significant potential to invade native vegetation.

***Lonicera japonica* Thunb.**

Japanese honeysuckle

Family: Caprifoliaceae

Lonicera japonica is a woody, twining, evergreen climber growing to about 2.5m (Bodkin 1992). It produces perfumed tubular cream-to-orange flowers. The leaves are broadly lanceolate to ovate (Auld and Medd 1987). It is native to Asia (Swarbrick and Skarratt 1994) and has been listed as a weed in New Zealand, Argentina and the United States (Holm *et al.* 1979). Naturalised populations exist in eastern New South Wales, south-east Queensland, the ACT and Victoria (Hnatiuk 1990, Swarbrick and Skarratt 1994). Perhaps the most extensive and problematic infestations occur in riparian vegetation and wet sclerophyll forest in Victoria (eg. on the Mornington Peninsular and in Ferntree Gully National park). *L. Japonica* represents a serious threat to numerous vegetation types in Victoria, including heathlands, moist sclerophyll forests and warm temperate rainforest (Carr *et al.* 1992). It has the ability to smother vegetation and exclude the growth of native species, particularly at the low shrub and grass/forb level.

**Lotus
corniculatus L.**

birdsfoot trefoil

Family: Fabaceae

A herbaceous perennial with a dense, recumbent canopy which forms a thick, fibrous mat (Turkington and Franko 1980). It has compound leaves which are minutely serrated and bright yellow and red flowers arranged in an umbel. The seeds are violently ejected when the pod splits and twists in a spiral (c. 20 seeds per pod and c. 5 pods per inflorescence). Reproduction may also occur from root segments. There is considerable morphological and physiological variation within the species.

L. corniculatus tolerates a range of edaphic and climatic conditions and often colonises pastures, roadsides, lawns and turf. It is more tolerant than other legumes to drought, water-logged, saline, acidic and calcareous or problem soils (Murphy *et al.* 1984). It is grown for hay, silage and pasture, especially in dairy production as it does not induce bloat (Davis and Linscott 1986). It can outcompete other pasture species particularly on infertile soils but is not so successful in fertile soils. Establishment is slow and the seedlings are small, non-aggressive and easily outcompeted. Shading can suppress growth (Davis and Linscott 1986). It is recorded as a weed in Egypt, Japan, Russia, Spain, Taiwan, New Zealand, Turkey and the United States (Holm *et al.* 1979). It is native to temperate regions of Europe and Asia but is now widely distributed throughout Canada, the United States, Siberia, parts of Africa and South America (Turkington and Franko 1980). Naturalised populations exist in Western Australia (where it is a weed along roadsides in the Albany region) and in Queensland, where it was first recorded on the Darling Downs in 1906 (Queensland herbarium records). It appears to be restricted to roadsides and may not have significant potential as an environmental weed.

Ludwigia palustris (L.) W. Elliot

**false loosestrife, water
purslane, marsh ludwigia**

Family: Onagraceae

A sprawling, herbaceous, perennial, semi-aquatic plant, which can float on water but usually grows attached to the bank or other substrate. Seed is dispersed by water and animals (Swarbrick and Skarratt 1994). It can also reproduce via stolons (Wells *et al.* 1986).

It is recorded as a weed in the United States (Holm *et al.* 1979) and South Africa (Wells *et al.* 1986). In South Africa, it competes with native vegetation and can obstruct water flow, leading to increased water stagnancy (Wells *et al.* 1986). It is widespread in Australia, especially in the north east of Victoria and southern New South Wales (Hosking *pers. comm.*). In Victoria, it exists as localised, small populations in permanent freshwater wetlands (Carr *et al.* 1992).

***Ludwigia peruviana* (L.) Hara**

Syn. *Jussiaea peruviana* L., *J. grandiflora* L.

Peruvian primrose, water primrose

Family: Onagraceae

A semi-aquatic shrub up to 3-4m tall with bright yellow flowers. Produces small seeds that germinate on floating vegetation or on mud banks. High germination rates have been achieved in the laboratory but approximately 20% of seeds display some form of dormancy (Jacobs *et al.* 1993). Water movement and ducks are the major dispersal agents of the seeds (Sainty and Jacobs 1988). It can be difficult to differentiate *L. peruviana* from the native *L. octovalvis* (Jacq.) Raven, but the seed pod of *L. peruviana* is short and stout compared to the elongated pod of *L. octovalvis*.

L. peruviana is native to tropical South America and has naturalised in Asia, Indonesia, India and North America. It is recorded as a weed in the Dominican Republic (Holm *et al.* 1979).

L. peruviana was introduced into the Sydney Botanical Gardens in 1907 and has since formed dense, monospecific stands over large tracts of the Botany wetlands and other wetlands from Gosford (north of Sydney) to Heathcote (south of Sydney) (Jacobs *et al.* 1993). It has been declared noxious in the Municipality of Botany in New South Wales and in Queensland.

L. peruviana has the potential to spread throughout tropical and temperate Australian waterways and to dominate wetland vegetation (Parsons and Cuthbertson 1991, Sainty and Jacobs 1988). Its presence in some areas may go undetected for some time because of its similarity to native species of *Ludwigia*. Dense stands of *L. peruviana* can intercept almost all incident light (Jacobs *et al.* 1993), in some cases leading to the loss of smaller native plants. In the Botany wetlands, it has displaced all other wetland vegetation to the extent that bird populations have been significantly reduced. In the Millpond-Botany area, *L. peruviana* has been burnt and chemically treated but control is proving difficult (Rawlings *pers. comm.*). Seed dormancy and the build-up of soil seed banks can reduce the effectiveness of control efforts.

***Lupinus arboreus* L.**

tree lupin, bush lupin

Family: Fabaceae

A short-lived, perennial, leguminous shrub, usually 1-2m tall. The leaves are pinnate with 5-12 leaflets. Flowers are usually yellow but can also be blue (rarely). The flowers arranged in loose racemes up to 30cm long. This species has been used as a cover crop to assist establishment of *Pinus radiata* on sand dunes in New Zealand (Marriot and Smith 1994).

L. arboreus is native to low altitude areas of northern, coastal California (Harrison and Maron 1995) and has been recorded as a weed in Chile and New Zealand (Holm *et al.* 1979). It has naturalised in Tasmania (Hnatiuk 1990) where it is a major weed of sandhills around Strahan (Hosking *pers. comm.*). In Victoria, it exists as medium to large populations of limited distribution and represents a threat to heathland, heathy woodland, alpine and sub-alpine vegetation (Carr *et al.* 1992).

In its native range it can form dense stands on sand dunes and other disturbed areas with the following effects; (1) increased levels of nitrogen in the soil (it fixes atmospheric nitrogen); (2) low light levels at the soil surface; (3) reduced recruitment of native plant species, and; (4) modified colonisation patterns (Alpert and Mooney 1996). On the coastal sand dunes around Strahan (Tasmania) it is showing potential to establish and spread. Other coastal dune systems throughout much of southern Australia are also at risk. Although the plant is not yet widely naturalised in Australia, eradication is considered unlikely given the extent and location of existing infestations.

Lupinus polyphyllus

Russell lupin

Family: Fabaceae

A perennial legume with flower colour varying from purple to yellow and red. Preferred habitats include areas with low fertility rocky, sandy, or loose textured soils and medium to high rainfall. The plant's large seed give it a distinct advantage for establishment in low fertility soils. It has been used extensively in "cottage gardens" and for revegetation purposes in Europe and New Zealand.

It is native to western North America and has become widespread in New Zealand (South Island), following the first major sowing in the high country in the early 1950's. Blood (*pers comet.*) reports that this species is widespread throughout the Victorian and New South Wales alpine region from Falls Creek to Kosciusko and Cabramurra. It could become more abundant in river beds of the temperate to alpine areas of Victoria, New South Wales and Tasmania.

***Matricaria recutita* L.**

Syn. *Chamomilla recutita*
(L.) Rauchert

**chamomile,
German chamomile**

Family: Asteraceae

Matricaria recutita is an aromatic annual herb up to 60cm tall (Anon. 1997h). The stems are glabrous, erect and densely branched. Its composite flowers have white ray florets and yellow disc florets (Harden 1992) that fade quickly (Anon 1997i). The centre of the flower head is hollow (Anon. 1997i). It reproduces from seeds.

M. recutita grows well in pastures with sandy soil in Europe and southern England (Anon. 1997j) but it prefers moist sandy soil with pH 6-8.5 and full sun (Anon. 1997h).

The flowers have been used in herbal medicines, to treat insomnia, indigestion, swollen gums, skin problems, as a tonic or as a sedative (Anon. 1997h). It is also used in pot pourri and as a hair cosmetic. Oils are extracted from the flowers and used as antiseptic, anti-inflammatory and anti-microbials (Anon. 1997j).

M. recutita is a common weed of England (Holm *et al.* 1979). It is native to Europe and western Asia and is naturalised in North America (Anon. 1997). The closely related *M. chamomilla*, is a serious weed throughout Europe and a weed of numerous countries of the temperate world (Holm *et al.* 1979). In Australia, *M. recutita* is naturalised as a roadside weed in the Southern Lofty region of South Australia and in the central-western slopes of New South Wales (Harden 1992, Hnatiuk 1990). It is not listed as an environmental weed of Victoria (Carr *et al.* 1992). Little is known of its distribution or impact in Australia. It may be being used widely by organic gardening groups as a companion plant and in cottage and herb gardens.

***Mentha piperata* L.**

catmint, peppermint

Family: Lamiaceae

A perennial plant (to c. 0.5m tall) which prefers fertile, well-drained soils (Bodkin 1986). It produces reddish-violet flowers and reproduces from seeds and rhizomes. The seeds are dispersed in water (Swarbrick and Skarratt 1994).

M. piperata is native to Europe and is listed as a weed in the United States and Chile (Holm *et al.* 1979). Small, isolated naturalised populations exist in riparian vegetation and damp sclerophyll forest in Victoria (Carr *et al.* 1992).

***Mentha spicata* L.**

spearmint

Family: Lamiaceae

M. spicata is an erect perennial herb (c. 60cm tall and c. 30cm in diameter) with glabrous stems and sessile, oblong or ovate to lanceolate leaves. The flowers are pale mauve and arranged on slender, whorled spikes. It prefers rich, moist soil in protected, shady positions (Bodkin 1990).

M. spicata is native to south and central Europe (Carr *et al.* 1992). It has been listed as a weed in New Zealand, Peru, the United States and Venezuela (Holm *et al.* 1979). It exists in Western Australia, South Australia, New South Wales, Victoria and Tasmania (Hnatiuk 1990). Most naturalised specimens occur along river banks, in damp areas and wet forest areas (Carr *et al.* 1992, Swarbrick & Skarratt 1994). The plant is believed to have escaped from gardens.

Mucuna pruriens
(L.) DC.

Syn. *Dolichos pruriens* L.,
Strizolobium pruriens (L.) Medic., *S.*
deeringianum Bert., *S. aterrimum*
Piper and Tracey; *S. niveum* Kuntze.

**cow itch,
velvet bean,
Bengal bean**

Family: Fabaceae

Mucuna pruriens is an annual (or sometimes short-lived perennial), leguminous vine capable of growing to 6m in length. The leaves are alternate with three large, rhomboid-ovate leaflets. The flowers are white to dark purple and hang in long racemes. *M. pruriens* produces clusters of pods that are curved (c. 4 to 8cm long) and contain 2 - 6 seeds. The seeds vary in colour from black, white to mottled. The pods are covered with reddish-orange hairs that are readily dislodged and can cause intense irritation to the skin (Michael 1989). It has been planted as a cover crop under coconut plantations in Sri Lanka (Ravindran 1988) and the pods and beans have been used to feed livestock (Ravindran 1988).

It is native to India and has become pantropical. It is recorded as a weed in Mozambique, Mexico, Madagascar, Jamaica and many other pan-tropical countries (Holm *et al.* 1979). It has a tendency to scramble over other vegetation, sometimes climbing to the tops of trees (Michael 1989). Michael (1989) listed *M. pruriens* as a significant potential weed threat to northern Australia. The plant generally requires a hot, moist climate for maximum growth' although cultivars have been developed which can grow in temperate climates (Whyte 1953 in Ravindran 1988). *M. pruriens* (L.) DC. and var. *utilis* (Wight) Burck. are cultivated as pasture plants in Queensland. The plant can grow in a range of habitats and could become naturalised in grasslands, bushland, riverine forest and forest edges throughout tropical and subtropical regions. Eradication is not considered feasible due to the plant's widespread use as a pasture legume.

Myosotis sylvatica
Hoffm.

wood forget-me-not

Family: Boraginaceae

Myosotis sylvatica is a biennial or perennial herb that grows up to 40cm high. The plant can have either an erect or spreading habit. Stems and leaves are densely pubescent. The flowers are bright blue with a yellow throat (Harden 1992). It is a weed in the Soviet Union (Holm *et al.* 1979).

M. sylvatica is native to Europe and northern Asia. It is being sold by nurseries in Victoria (Carr *et al.* 1992) and is naturalised in south-east South Australia, the southern Tablelands of New South Wales, Canberra, Victoria and Tasmania (Hnatiuk 1990). In Victoria, it occurs as small populations with limited distribution in wet and damp sclerophyll forests and riparian areas (Carr *et al.* 1992).

M. sylvatica is a serious weed of creek-banks in Porongurup National Park in south west Western Australia (Keighery 1994) and is considered to be a serious threat to wet and damp sclerophyll forests and riparian areas in Victoria (Carr *et al.* 1992). Continued sale by nurseries will accelerate the plant's spread into additional areas.

***Oenanthe
pimpinelloides* L.**

water dropwort

Family: Apiaceae

Oenanthe pimpinelloides is a perennial herb which reproduces from tubers (Swarbrick & Skarratt 1994). It is native to the Mediterranean and has been listed as a weed in Turkey (Holm *et al.* 1979). In Australia *O. pimpinelloides* occurs in the Meadows area (South Australia), where it inhabits moist pastures/wetlands (Swarbrick & Skarratt 1994).

***Oenothera
stricta* Link**

common evening
primrose

Family: Onagraceae

Oenothera stricta is an erect, broad-leaf, biennial or perennial herb to c. 1m tall, sometimes becoming woody. The leaves are hairy, 2-6cm long, linear to lanceolate. Flowers are 2-4cm in diameter, yellow changing to burgundy red, four-petalled and arranged in long, leafy spikelets. The fruit is a capsule 2-3cm long. Reproduction occurs from seeds. It is native to South America (Chile and Argentina) and is a weed in Hawaii, South Africa, New Zealand and Chile (Holm *et al.* 1979). In South Africa, it competes with native vegetation in temperate and sub-tropical areas (Wells *et al.* 1986). *O. stricta* has naturalised in all States and Territories of Australia (Hnatiuk 1990) and is widespread in Victoria and south-western Western Australia (Swarbrick and Skarratt 1994). It inhabits roadsides and other disturbed areas, especially on sandy soils (Auld and Medd 1987).

***Opuntia elatior* Mill.**

Family: Cactaceae

Opuntia elatior is a densely branched, succulent, spiny cactus often up to 4m tall (Harden 1990). The stem segments are obovate, compressed, mostly 10-20cm long (up to 40cm long) and are not glaucous. The leaves are 4mm long and red-tipped. The spines are mostly 2-4cm long (up to c. 7cm). The perianth is yellow and the anther filaments pink (Harden 1990). Reproduction occurs from seed and broken stem fragments (Swarbrick and Skarratt 1994). The plant's fruit are eaten and dispersed by birds and possibly other animals. *O. elatior* is native to tropical (South) America and has been listed as a weed in India (Holm *et al.* 1979). It has naturalised on offshore islands in Western Australia (Dodd [pers. comm. in](#) Swarbrick and Skarratt 1994), in Central Australia (Northern Territory), south-eastern South Australia, southeast Queensland, central and southern New South Wales (Hnatiuk 1990).

Opuntia imbricata
(Haw.) DC.

**devil's rope pear,
imbricate cactus**

Family: Cactaceae

Opuntia imbricata is a much-branched, spiny, perennial shrub (to c. 3m tall) with segments growing at all angles to the upright branches. Its flowers are dull red-purple and 4-9cm in diameter. It is native to Central America (Wells *et al.* 1996) and has been listed as a weed in South Africa and the United States (Holm *et al.* 1979). Scattered naturalised populations exist in Queensland, New South Wales, the Northern Territory, Victoria and South Australia. It is commonly found around mining areas (Harden 1990) and is considered to pose a threat to grassland in Victoria (Carr *et al.* 1992).

Orobanche
***ramosa* L.**

branched broomrape

Family: Orobanchaceae

Orobanche ramosa is a leafless parasitic biennial or perennial with thick, fleshy roots and cream to brown stems that branch just above the ground. It stands 5-30 cm high and produces terminal spikes of pale to bright blue or violet flowers. A single plant can produce some 100,000 seeds that look like finely ground pepper and remain viable for at least nine years. *O. ramosa* must attach to the root of a host plant within a few days of germination in order to derive nutrients needed for further growth. It emerges from below the soil surface in October to flower and produce seed. Host plants include various crops, legumes and grasses.

O. ramosa is native to Europe and Asia (Wells *et al.* 1986). It is listed as a weed in 24 countries, including Lebanon, Nepal, Turkey, South Africa, the former Soviet Union, the former Yugoslavia, England, France, Germany, Greece, India, Israel, Romania, Sudan, and the United States of America: (Holm *et al.* 1979). A naturalised population exists in a dryland pasture between Bowhill and Murray Bridge in South Australia (Carter and Cooke 1994) and an eradication program is in place (Carter *et al.* 1996). The *Orobanche* genus was highlighted as a quarantine threat to Australia in 1991 (Csurhes 1991).

***Oxalis* spp.**

Family: Oxalidaceae

This genus consists of some 800 species from around the world (Harden 1991). It contains many ornamentals, noxious weeds and environmental weeds. Most species are perennial herbs or occasionally shrubs, often with three leaflets, tubers or bulbs. *O. latifolia* (oxalis, fishtail

oxalis) and *Oxalis pes-caprae* (soursob) are the best known weeds of this genus being particularly prevalent in agriculture. Some of the environmental weeds include *O. corniculata* (yellow wood sorrel) *O. purpurea* (large flowered wood sorrel) and *O. corymbosa* (pink shamrock) (Parsons & Cuthbertson 1992). *Oxalis spp.* commonly originate from the warm-temperature and sub-tropical regions of Central and South America and South Africa.

Of the thirty *Oxalis spp.* found in Australia, twenty are naturalised (Hnatiuk 1990). In Victoria, *O. articulata*, *O. bowiei* and *O. obtusa* have been rated as potential threats to a number of ecosystems, whereas *O. incarnate*, *O. latifolia*, *O. pes-caprae* and *O. purpurea* are considered to be serious threats to a number of vegetation communities (Carr *et al.* 1992). Burke (1995) described a number of *Oxalis* species that have escaped from gardens and have naturalised in wasteland, riparian vegetation and urban bushland in Western Australia (1995).

***Parietaria
judaica L.***

sticky weed, pellitory

Family: Urticaceae

A perennial herb (to c. 1 m tall) with brown-reddish, hairy stems. The flowers are small and greenish and arranged in axillary clusters. Dispersal is by seed which can be carried by flowing water or adhere to the fur of animals and human clothing. Seeds will germinate throughout the year (Parsons and Cuthbertson 1992).

It is native to the Mediterranean region (Parsons and Cuthbertson 1992) and is listed as a weed in New Zealand and Greece (Holm *et al.* 1979). Naturalised populations exist in South Australia, Queensland and New South Wales (Hnatiuk 1990). In the Sydney area, it competes with other species, even replacing some and forming dense monotypic stands (Parsons and Cuthbertson 1992). The 'Bushland Weeds Education Group' (1992) in Sydney listed it as a species that has potential to become much more invasive in the future. It has been classed as "noxious" for the municipality of Mossman in New South Wales (Parsons and Cuthbertson 1992). It is very common in the suburbs of Melbourne, where it grows in gardens and pavements (Blood *pers. comm.*). It is predicted to have some environmental impact on open, rocky positions such as rock ledges of cliffs and gullies where it can exploit moisture in the fissures and compete with native plant species. Eradication is not considered possible since the plant is very widespread.

***Paulownia
tomentosa*** (
Thunb.) Steud.

Chinese empress tree

Family: Scrophulariaceae

A rapidly growing deciduous tree (c.10-20m tall) with a branched crown and large leaves (up to 40cm across). It produces clusters of trumpet-shaped cream to mauve flowers. The pods mature in autumn and point upwards before splitting along two seams and releasing millions of tiny wind-blown seeds (Anon. 1996). One tree can produce 20 million seeds per year (Anon. 1996). The seeds are short-lived, with no dormancy (Bond 1993). Mature plants can regenerate vigorously after coppicing or stump-cutting (Bond 1993). Growth can be very rapid in the first 20 years, after which it shows exceptionally slow growth (Borough 1991). For rapid growth to occur, the plant requires full sunlight, ample soil moisture and fertile soil (Boroughs 1991).

PP tomentosa is native to south-eastern China. It was introduced into the USA in 1834 and immediately escaped cultivation, becoming naturalised from Georgia to New York (Anon. 1996). In China, it exists as scattered individuals in disturbed forests (Borough 1991). There has been no research on the weed potential of *Paulownia* species (Bond 1993). The only information in Australia relates to ornamental use and forestry trials in south east Queensland and north Queensland. In forestry trials it performed badly and suffered heavily from insect attack (Bond 1993). Landcare members at Beechmont (Queensland) have expressed concern over the vegetative reproductive capacity of cuttings and the regenerative capacity of the cut stumps. Since it is a pioneer species, it may have some potential as an environmental weed in highly disturbed tropical habitats, such as the edges of rainforests, where sunlight, moisture and nutrients are in good supply.

PP tomentosa is currently being widely promoted in Australia for investment agroforestry. Although the wood is light and quite weak, it can be used to make bowls, utensils, plywood panels, furniture and musical instruments.

***Pennisetum
alopecuroides*** (
L.) Sprengel

swamp foxtail grass

Family: Poaceae

Pennisetum alopecuroides is a tufted perennial grass (c. 1m tall). Its leaves are long, narrow, tapering gradually to a point; seed-heads grow to about 7.5cm long and 2.5cm wide, cylindrical with stiff, often purple-coloured bristles arising below the seeds which are carried on short stalks from the main axis (Kleinschmidt & Johnson 1979). The origin of *PP alopecuroides* is uncertain. It has been recorded as a weed in China, Japan and New Zealand (Holm *et al.* 1979).

Naturalised populations of *PP alopecuroides* can be found in south-east Queensland, throughout New South Wales, northern Victoria and Tasmania (Hnatiuk 1990). The plant prefers poorly drained, coastal habitats. At several locations in south-east Queensland, it has become a pest in degraded pastures (Kleinschmidt & Johnson 1979). It is considered to represent a very serious threat to lowland grassland, grassy woodland, dry sclerophyll forest and woodland in Victoria (Carr *et al.* 1992).

***Pennisetum
macrourum* Trin.**

African feather grass

Family: Poaceae

Pennisetum macrourum is an erect perennial grass (c. 1 - 2m tall). The stems are erect, cylindrical, unbranched and glabrous, with several stems emerging from a crown. The leaves are light green and heavily ribbed on the upper surface, darker green beneath, sometimes purplish along the edges and at the tips; to 1.2m long, 1.2cm wide, finely serrated on ribs, slightly curled, sometimes drooping, up to 5 leaves per stem. The inflorescence is straw-coloured, spike-like, 10-30cm long and is erect or drooping (Harden 1993, Parsons & Cuthbertson 1992). Reproduction occurs from animal and water-dispersed seed and rhizomes (Swarbrick and Skarratt 1994).

PP macrourum is a native to South Africa and has been listed as a weed in New Zealand (Holm *et al.* 1979). It has naturalised in Victoria and South Australia (Swarbrick and Skarratt 1994). The plant prefers subhumid warm-temperate regions (usually where annual rainfall exceeds 600mm) and normally occurs on streambanks, roadsides and pastures, often in sandy soil (Parsons and Cuthbertson 1992). Infestations of *P macrourum* were first confined to moist areas near rivers, lagoons and other low lying areas subject to flooding. It has gradually spread beyond such places to drier, improved or unimproved areas (Lamp *et al.* 1990). *PP macrourum* is considered to be a serious threat to lowland grassland and grassy woodland, riparian vegetation and freshwater wetland in Victoria (Carr *et al.* 1992).

***Pennisetum
polystachion* (L.)
Schultes**

*Sam Panicum
polystachion* L.

mission grass

Family: Poaceae

Pennisetum polystachion is a clumping annual or perennial grass (2 to 3m tall) with fibrous roots that lack stolons (Smith 1995). The flower heads are spike-like, pale yellow to brown and erect to slightly drooping. Reproduction occurs from seeds which are light and fluffy. The seeds can be dispersed by flowing water, strong winds or they may adhere to clothing, vehicle radiators, wool and bags (Smith 1995, Parsons and Cuthbertson 1992). *P polystachion* is similar in appearance to *P. pedicellatum*, another introduced grass (Smith 1995).

PP polystachion is a native to tropical Africa but is now pantropical (Smith 1995). It has been listed as a weed in Thailand, India, Angola, Sri Lanka, Fiji, the Ivory Coast, Melanesia, Nigeria and the Philippines (Holm *et al.* 1979). It was introduced into Australia as a pasture species and now occurs in the Gulf region, Cape York, Kakadu, Darwin, Katherine, Pine Creek (Swarbrick & Skarratt 1994), Nabarlek in Arnhem land and Western Australia (Smith 1995). It rarely establishes outside the tropics (Parsons and Cuthbertson 1992). Populations of *P polystachion* are expanding rapidly in the Northern Territory (Smith 1995). It inhabits disturbed areas including roadsides, degraded pastures and waste sites. It has been declared a noxious weed in the Northern Territory since it competes with pastures and displaces native plant species (Smith 1995). The plant provides fuel for extremely hot, late season fires and may have altered natural fire regimes (Smith 1995).

***Pennisetum
purpureum***
Schumach.

elephant grass,
napier grass

Family: Poaceae

Pennisetum purpureum is a tall (to c. 4m) perennial grass which forms bamboo-like, densely tufted clumps. Its leaves are c. 2.5cm wide with a prominent mid-vein and tapering to a fine point. The inflorescence is a dense cylindrical spike between 8-30cm long and 2.5cm wide, yellow to purple in colour. This species is often cultivated for windbreaks and for forage (Harden 1993).

P. purpureum is native to tropical Africa (Kleinschmidt and Johnson 1987) and has become naturalised in many other parts of the world. It is listed as a weed in Colombia, Mozambique, Trinidad, Hawaii, the Philippines, Puerto Rico, Borneo, Brazil, Cuba, Honduras, Kenya, Malaysia, New Guinea, Western Polynesia, South Africa, Thailand, Uganda, the United States and Venezuela (Holm *et al.* 1979).

In South Africa, *P. purpureum* has replaced indigenous vegetation (Wells *et al.* 1986).

Naturalised populations exist in northern parts of Western Australia, Darwin and the Gulf and the Queensland tropics (Hnatiuk 1990).

***Pennisetum
setaceum*** (Forssk.)
Chiov.

fountain grass

Family: Poaceae

Pennisetum setaceum is a densely tufted perennial which grows to 90cm high. The inflorescence is a long, pink, feathery spike. It is cultivated as an ornamental for its graceful, arching habit and occasionally escapes cultivation (Harden 1993).

P. setaceum is a native to North East Africa and has been listed as a weed in Hawaii, the United States (Holm *et al.* 1979) and South Africa (Wells *et al.* 1986). It has naturalised over a wide range from Western Australia to the south-eastern corner of South Australia, northern Queensland, the greater Brisbane area and most of New South Wales (Hnatiuk 1990).

***Peperomia
pellucida* (L.)
Kunth.**

Syn. *Piper pellucidum* L.

Family: Piperaceae

Peperomia pellucida is an erect branching, succulent plant (to c. 25cm tall) with palmately veined or striated, alternate, glabrous and apically pointed leaves. The flowers are solitary spikes. It is sometimes used in Asian cooking.

P. pellucida is native to tropical America (Kuo 1978) and has been recorded as a weed in 14 pan-tropical countries (Holm *et al.* 1979). In North America, it inhabits shaded woods, coastal plains and open areas around plant nurseries and greenhouses (Anon 1997). It is widely naturalised in Queensland and the Northern Territory, primarily in agricultural and urban environments. Keighery (*pers. comm.*) reported that it has been found in nursery stock and potting mixes and is a garden weed in Broome, Western Australia. In the Northern Territory it is a common weed around plant nurseries and shade houses.

***Phleum pratense* L.**

Syn. *Phleum nodosum* L.

Timothy grass

Family: Poaceae

Phleum pratense is a tufted perennial (up to 1.5m tall and 1m in diameter) which prefers heavy, moist soils and temperate climates. The flowers are long, cylindrical spikelets. It is commonly planted as a hay and pasture plant. It is native to Europe and Asia (Wells *et al.* 1986) and has naturalised in many other parts of the world. Holm *et al.* (1979) listed the plant as a weed in Colombia, Finland, Russia, Spain, New Zealand, Peru and the United States.

P. pratense is naturalised throughout parts of Western Australia, the south-east corner of South Australia and throughout central and southern New South Wales, across Victoria and north-east Tasmania (Hnatiuk 1990). It poses a significant threat to dry coastal vegetation, dry sclerophyll forest and woodland in Victoria (Carr *et al.* 1992).

Pinus pinaster
Aiton.

cluster pine,
maritime pine

Family: Pinaceae

Pinus pinaster is a large tree which is cultivated as a wind break, for timber and as a garden ornamental. It reproduces from wind-dispersed seeds which can travel up to 1 km from the parent tree (Kruger 1977). Growth is most prolific on acidic, leached soils in areas that have temperate (winter and summer rainfall) and sub-tropical (summer rainfall) climates. Under suitable conditions, *P. pinaster* can form a monospecific, even-aged woodland or forest (Kruger 1977). It does not resprout after fire but seedling reproduction can be prolific. Seedling establishment is usually limited to a short period following fire and does not generally occur under live stands of trees. Corbett (1991) reported, however, that cluster pine had established and regenerated in the absence of fire, or other forms of disturbance.

P. pinaster is native to Europe and North Africa (Mediterranean and sub-Mediterranean climate) and is common in the maquis and garrigue vegetation types of the Mediterranean. It is listed as a weed of native vegetation in South Africa (Wells *et al.* 1986), where it has reduced plant diversity and affected species composition in Cape fynbos ecosystems (Kruger 1977). Stands of *P. pinaster* are a serious threat to plant communities in high altitude regions of South Africa (Moll and Trinder-Smith 1992).

Naturalised populations exist in Queensland, New South Wales, Victoria, South Australia (southern Lofty region) and Western Australia (Hnatiuk 1990, South Australian herbarium, Kruger 1977). It escaped from plantations in Western Australia and has invaded bushland near Esperance (Kruger 1977). It has also invaded large areas of *Leptospermum* and *Casuarina* heathlands and *Eucalyptus* woodlands on French Island in Victoria (Corbett 1991). Dense growth of *P. pinaster* can be expected to reduce local populations of most native wildlife, however, Saunders (1974) (in Kruger 1977) reported that white-tailed black cockatoos seasonally congregate in *P. pinaster* plantations and strip cones from the trees. As such, the plant may provide food and habitat for a small number of wildlife species.

The plant can germinate in closed heath, at very low light intensities (Corbett 1991). It has a thick, corky bark which protects it from relatively low intensity fires (Kruger 1977). The flush of seedlings following fire make it a vigorous competitor in dry eucalypt forests. Dense stands of even-aged populations can establish in response to a regular burning cycle and populations tend to remain static in the absence of fire (Kruger 1977). It is highly flammable when green or dry and dense growth can alter natural fire regimes.

P. pinaster is too widespread for eradication to be feasible. Measures should be taken to contain existing populations. Control practices currently require a combination of cutting and/or burning (Corbett 1991).

***Polygala
paniculata* L.**

Family: Polygalaceae

Polygala paniculata is an erect, much branched annual herb (c. 10-50cm tall) (Harden 1992). The leaves are glabrous and narrowly elliptical. The flowers are white or pink to purple and c. 2mm long. The fruits are elliptical capsules (c. 1x2mm), dehiscent, green. The seeds are black.

Worldwide, there are more than 500 species in the Polygalaceae family, with 15 species in Australia; 13 species endemic and three species naturalised (Harden 1992). *P. paniculata* is native to tropical America and has naturalised along the central and north coast of New South Wales and in coastal south-east Queensland (Harden 1992, Hnatiuk 1990). It is a weed in Indonesia, Fiji, New Guinea and Western Polynesia (Holm *et al.* 1979).

***Populus* spp.**

Populus alba L.

Populus nigra L.

**poplar tree
white poplar, silver-
leaved poplar, abele
lombardy poplar,
black cherry**

Family: Salicaceae

Most species of *Populus* are broad-leaved deciduous trees native to either North America, Europe or Asia. Reproduction occurs from seeds or root-suckers. At least four species have been introduced into Australia for use as ornamentals, wind breaks and for their timber products. They are widely available through the nursery trade (several hybrids and cultivars are available). Holm *et al.* (1979) listed ten species of *Populus* as weeds in the United States, including *P. alba* and *P. nigra*.

Populus species are grown in all States of Australia except the Northern Territory. Most specimens exist in temperate regions of southern Australia. Four species have naturalised (Hnatiuk 1990). Additional species are being imported and Groves *et al.* (1996) recorded two relatively recent introductions.

P. alba and *P. nigra* are environmental weeds in South Africa (Wells *et al.* 1986). In Western Australia, *P. alba* has formed dense stands in disturbed wetlands from Perth to Albany (Keighery 1994). It is considered to have significant weed potential in the ACT (Berry and Mulvaney 1995). *P. alba* has established medium to large populations in Victoria and is considered to pose a threat to riparian vegetation (Carr *et al.* 1992). *P. nigra* has formed dense suckering stands in wetlands near Perth (Keighery 1994). It has a restricted distribution in the ACT but has a moderate to high weed potential (Berry and Mulvaney 1995). *P. nigra* reproduces by seeds that are dispersed in water. It exists as localised populations in Victoria (Carr *et al.* 1992).

At least four species of *Prosopis* and an unknown number of hybrids have naturalised in Australia. In Western Australia, almost 120,000ha are infested with mesquite (Dodd and Martin 1986). In New South Wales, the total area has been estimated at about 24,000ha (mostly *PP juliflora*). In the Northern Territory, *PP pallida* occurs in the Barkly Tablelands and Alice Springs districts. In Queensland, *P pallida* occurs over some 500,000ha of north-west Queensland (March 1995) and *P glandulosa* var. *glandulosa* occurs as scattered plants near Gladstone. An unknown hybrid (possibly *PP juliflora* X *P. velutina* or *P pallida* X *P. glandulosa* X *P. laevigata*) occurs at south-western McKinlay, Qld (c. 10,000ha subject to a control program). *P velutina* ("Quilpie mesquite") may be restricted to approximately 13 properties around Quilpie in the State's south west (currently the subject of an eradication program that will have treated every seeding tree by June 1997). Existing control programs utilise herbicides and mechanical control (bulldozers). *P velutina* may also exist in New South Wales.

With their potential to colonise most semi-arid and arid areas, mesquites are predicted to become some of Australia's worst environmental weeds, especially along watercourses. Humphries *et al.* (1991) stated that "native vegetation could be replaced with thorny mesquite thickets in much of the semi-arid zone within the next 100 years if its spread is not curtailed". The area of land currently affected is only a fraction of the area at risk. Estimates based on climatic parameters suggest mesquite species have the potential to become established on grazing land over at least 60% of Queensland (1,036,200 km², QDNR unpubl.). In general, soil moisture appears to determine mesquite distribution rather than soil type (mesquite tends to establish most successfully on clay soils and alluvial soils which have good moisture retention).

Complete eradication of *P pallida*, *P juliflora*, *P glandulosa*, *PP velutina* and associated hybrids is very unlikely due to the large areas involved and the resilience of seed banks in the soil. Regional eradication programs are feasible, however, and a major control program is currently under way in Queensland.

Prunus serotina
Ehrh.

wild cherry

Family: Rosaceae

Prunus serotina is a deciduous tree (c. 30m tall) with dark, smooth bark. The leaves are alternate, deciduous, light green, elliptic to lanceolate, 6 - 12cm long, 2 - 5cm wide, crenate to crenate-serrate, with two small glands near the juncture of the blade and petiole (Harden 1992). They have a distinctive acrid taste and odour. The white flowers are arranged in terminal racemes 4 - 10cm long and are followed by black, shiny fruit. Propagation occurs from seed.

P serotina is native to North America (Bodkin 1986) and has been recorded as a weed in the United States (Holm *et al.* 1979). It has naturalised in the central Tablelands of New South Wales (Hnatiuk 1991) and has the potential to spread more widely in temperate regions (temperate humid zone and southern sub-humid zone) of Australia.

***Psidium cattleianum*
Sabine var *littorale*
Radd., var *cattleianum***

strawberry guava

Family: Myrtaceae

Psidium cattleianum is a small, erect tree (to c. 10m tall and 4m wide)(Bodkin 1992). *P. cattleianum* var. *littorale* produces juicy, yellow fruit, whereas *P. cattleianum* var. *cattleianum* produces red fruit. Seed production can be prolific and seeds germinate under a wide range of conditions. In Hawaii, seeds are spread by exotic birds and feral pigs but germination and establishment does not totally depend on animal dispersal or related disturbance (Huenneke and Vitousek 1990).

- *cattleianum* has been recorded as a weed in Hawaii, the United States (Holm *et al.* 1979) and the La Reunion Islands (Indian Ocean) (Mac Donald *et al.* 1991). It has invaded a variety of native ecosystems in Hawaii, ranging from dry to wet forests at altitudes between 100m and 1000m (Huenneke and Vitousek 1990) and ranks as one of Hawaii's worst weeds (Tucker *pers. comm.*).

- *cattleianum* var. *littorale* exists as scattered naturalised populations in rainforest and eucalyptus communities from south-east to far north Queensland (Queensland herbarium). Naturalised specimens of *P. cattleianum* var. *cattleianum* have not been recorded in Queensland (Queensland herbarium), however, var. *littorale* and var. *cattleianum* cultivars are both available from nurseries in Queensland (Lawson 1996). The plant is also cultivated in the Northern Territory (Cowie *pers. comm.*).

- *cattleianum* has the potential to become more abundant in native forest systems in higher rainfall areas of the coastal tropics and sub-tropics; mainly the wet tropics of north Queensland, south-east Queensland and northern New South Wales. Prolific seed production combined with effective seed dispersal mechanism and the production of suckers make control difficult.

***Psidium guajava* L.**

common guava, yellow
guava

Family: Myrtaceae

Psidium guajava is a tree c. 4m tall. It is native to tropical America. In mild climates it can fruit and flower throughout the year provided soil moisture and temperatures are not limiting. Specific flowering and fruiting seasons are observed in some regions (Rathore 1976). The flowers usually open in the early morning and appear adapted for both wind and insect pollination (Hedstrom 1988). The seeds are dispersed by birds, mammals, domestic livestock and man (Somarriba 1986). The fruit is used commercially for jams and juices.

P. guajava is a weed in Fiji, Hawaii, Melanesia, Mexico, Tanzania and West Polynesia (Holm *et al.* 1979). It is listed as the third most prominent invasive alien woody plant along roadsides and watercourse crossings in provinces of South Africa and was the most frequently recorded species for the coastal belt (Henderson 1989). In the coastal belt of South Africa, it not only

invades disturbed sites, where it forms dense stands, but also the coastal grasslands, bush clumps, forest patches and riverine vegetation (Henderson 1989).

PP *guajava* has naturalised in coastal Queensland, the Northern Territory and Western Australia. In the Northern Territory, isolated specimens exist in abandoned settlements but they are attacked by termites (Cowie *pers. comm.*). In northern Queensland, it is host to the papaya fruit fly and is being targeted for eradication by the Queensland Department of Primary Industry (Clarkeson *pers. comm.*). Van Haaren (*pers. comm.*) suggests, however, that total eradication from Queensland is not feasible. Chemical control is often ineffective.

Pupalia lappacea
L. (L.) A. L. Juss.

sweethearts

Family: Amaranthaceae

Pupalia lappacea is an erect, perennial herb that is semi-deciduous and reproduces from seeds (Wells *et al.* 1986). It is a weed in Ghana and India (Holm *et al.* 1979) and Wells *et al.* (1986) describe it as a general pastoral and agricultural weed of South Africa.

P lappacea is native to Europe and Asia (Wells *et al.* 1986). In South Africa, it occupies summer rainfall areas of both temperate and subtropical areas. In Australia, it has been recorded in Western Australia and the Northern Territory (Hnatiuk 1990).

Pyrostegia venusta
(Ker-Gawler) Miers

Syn. Bignonia ignea,
B. venusta

flame vine,
flame flower

Family: Bignoniaceae

Pyrostegia venusta is a woody, evergreen, perennial climber with ribbed branchlets (Harden 1992). The leaves comprise 2-3 lanceolate leaflets often with the terminal leaflet modified to form a tendril. The inflorescence is a large head of bright orange tubular flowers which cover the entire plant in spring (Ellison 1995). Although the plant is known to produce a seed capsule, it is uncertain if this ever occurs in Australia (Harden 1992). The plant is propagated from cuttings and suckers (Ellison 1995) and is grown as a garden ornamental throughout temperate tropical and subtropical regions of the world.

P venusta is native to Brazil and Paraguay (Harden 1992) and has been recorded as a weed in Peru (Holm *et al.* 1979). It is widely grown in private gardens across northern Australia and is available from most nurseries (including another similar species, *P ignea* Presl. (Lawson 1997) which is also a weed of Brazil (Holm *et al.* 1979)). *P venusta* has naturalised in coastal districts of central and north coast New South Wales (Harden 1992), however, there is little information available on its impact.

***Retama raetam*
(Forsskal) Webb.**

white weeping broom

Family: Fabaceae

Retama raetam is a shrub (to c. 3m tall) native to the Mediterranean. Reproduction occurs from seeds. It is very closely related to *Retama monosperma* and the names are used interchangeably by the nursery industry. It is a weed in California and Oregon in the United States. Naturalised populations exist on the Eyre and Yorke Peninsulas, South Australia, in scrub and woodland on coastal, sandy soils (Swarbrick and Skarratt 1994). The plant is grown as a garden ornamental.

***Rivinia humilis* L.**

**baby pepper, bloodberry,
coral-berry, rouge plant**

Family: Phytolaccaceae

Rivinia humilis is an erect annual, or short-lived woody perennial herb up to 1m tall (Kleinschmidt and Johnson 1987). It has bright green lance-shaped leaves up to 10cm long that give off a foul odour when crushed. Small white flowers occur on slender spikes from the upper leaf stalks (Kleinschmidt and Johnson 1987). The bright red berries contain one seed. It is native to South America (Bodkin 1986) and is a weed in Melanesia, Columbia, Fiji, Honduras, Jamaica and Nicaragua (Holm *et al.* 1979). Naturalised specimens exist in rainforest and vine scrub at Brunswick (New South Wales), Rockhampton (Queensland) and Kondalilla (Queensland) (Swarbrick and Skarratt 1994). It usually grows along the edges of rainforest, in clearings or other shaded places on the coastal belt (Kleinschmidt and Johnson 1987).

Salix spp.

willow

Family: Salicaceae

Deciduous trees, c. 5-20m tall. Worldwide, there are over 300 willow species, most of which are native to temperate and cold regions of Europe, America and Asia (Cremer *et al.* 1995). More than 100 *Salix* taxa have been deliberately introduced into Australia (Cremer *et al.* 1995). Identification of species and varieties in Australia is often difficult due to hybridisation between species, the production of fertile hybrids and morphological variation with age, season and growing conditions. Spread is mostly via wind-dispersed seed (seeds are short-lived). Germination and successful establishment are generally restricted to continuously wet river margins (Cremer *et al.* 1995). Plants start producing seed after 3-8 years.

Holm *et al.* (1979) listed 18 species as weeds in New Zealand, Finland, Afghanistan, Israel, the United States, Brazil and Uruguay. Only three of the species listed by Holm *et al.* (1979) as weeds overseas exist in Australia (Groves 1996). At least 16 species and varieties have naturalised in Australia (Groves 1996). *Salix* species can survive over a wide geographic range; from Tasmania to southern Queensland and from wet to semi-arid areas (Cremer *et al.* 1995). They have been used extensively for ornamental purposes and for river bank protection.

Salix species are a major threat to the riverine and freshwater wetland systems around Canberra, southern New South Wales and in north-eastern Victoria. Riverine vegetation in other temperate regions may also be vulnerable to invasion. Dense growth of seedlings and young trees can alter stream beds and channel flow, resulting in increased bank erosion. *Salix* species are very widespread in public and private gardens. Eradication is not considered feasible but strategic containment, particularly in significant remnants of riparian vegetation, needs to be undertaken. Control recommendations are provided by Cremer *et al.* (1995).

***Sansevieria
guineensis (Jacq.)
Willd.***

Family: Agavaceae

The *Sansevieria* genus contains c. 100 species native to tropical Africa and Asia. (Harden 1993). *S. guineensis* has not been listed by Hnatiuk (1990) and might be highly localised in Australia. It is a perennial herb with succulent, fibrous leaves. It reproduces from rhizomes and was probably introduced into Australia as a garden ornamental. It is related to *S. trifasciata* Prain (mother-in-law's tongue) which is a common weed of dry sclerophyll forest and riparian vegetation in Brisbane. *S. guineensis* is listed as a weed in Puerto Rico and the Dominican Republic (Holm *et al.* 1979).

Schinus molle L.

**Californian pepper tree,
pepper corn tree,
pepperina**

Family: Anacardiaceae

A large tree (c. 5-10m tall and 5-10m wide) with pinnate leaves and heads of small white flowers followed by spherical, rose-pink berries. It is native to Peru (Bodkin 1986) and is listed as a weed in the United States (Holm *et al.* 1979). Hnatiuk (1990) recorded the plant to exist in South Australia (Flinders Ranges, eastern and south-eastern South Australia, Eyre Peninsula, Murray, Yorke Peninsula, Southern Lofty), Queensland (Darling Downs and Moreton regions) and New South Wales. It has naturalised in riparian vegetation near Warwick (south-east Queensland) and appears to be spreading. It may have pest potential in dry temperate to tropical zones, primarily along the banks of watercourses. It appears tolerant of poor soils. It is very common in gardens and stock yards.

***Schinus
terebinthifolius***
Raddi.

broad-leaf pepper tree

Family: Anacardiaceae

A broad-topped, fast-growing, multi-stemmed shrub or small tree (c. 1-5m tall) that reproduces from seed (Tarver *et al.* 1978). The leaves have 3 - 13 sessile (or nearly sessile) oblong or elliptic, finely-toothed, glossy, resinous, aromatic leaflets, 2.5 to 5cm long (Morton 1978). Dense panicles of ivory-white flowers are followed by masses of green berries that turn bright red when ripe. The small berries (c. 6mm diameter) are dispersed by birds.

S. terebinthifolius is indigenous to the coast of tropical Brazil and can grow in the outer limits of vegetation exposed to salt spray (Morton 1978). It is cultivated as a garden ornamental in Florida (Morton 1978), Australia and probably many other countries. It is recorded as a weed in Hawaii, the United States (Holm *et al.* 1979) and South Africa (Wells *et al.* 1986). Morton (1978) reported that it has crowded out native vegetation over vast areas of Florida (including the everglades), the Bahamas and all the islands of Hawaii. It primarily invades degraded sites and the early successional stages of wetland and, riparian vegetation, but may also become established in more mature communities.

Naturalised populations exist throughout south-east Queensland, north-east New South Wales and parts of Western Australia. Dense infestations occur on waterlogged or poorly drained soils in coastal areas of south-east Queensland. At a few locations it has formed an understorey within mature stands of *Casuarina glauca* (swamp oak) and along the edges of mangrove forest (in moist soil just above high water mark). It can rapidly colonise disturbed bushland in low-lying areas and may suppress establishment of native vegetation. In the latter habitats, *S. terebinthifolius* may replace various species of grasses, sedges and other ground plants. Fire does not appear to control the plant as it has been observed to quickly regrow from the base. The plant is closely related to poison ivy (*Toxicodendron radicans* Kuntze.) (Morton 1978) and the fruits have been reported to be toxic to birds and mammals.

***Spathodea
campanulata***

African tulip tree

Family: Bignoniaceae

Spathodea campanulata is an erect tree (c. 10 - 15m tall) native to tropical regions of west Africa. It prefers fertile, well-drained soils with plenty of organic matter (Bodkin 1986). The leaves are pinnate with 7-19 oval leaflets. The fruit are woody capsules that split open when dry. Each pod contains hundreds of seeds, each having a silky pappus to aid wind-dispersal. It is reported to be a major problem in Hawaii (Dunstan, *pers. comm.*) and has the potential to invade rainforest and riverine systems in tropical coastal regions of northern Australia. At present, scattered naturalised specimens exist throughout much of the coastal, high-rainfall areas of the 'wet tropics' in north Queensland. Naturalised specimens have been recorded up to 10km from settlement in rainforest in north Queensland (around Cairns). Many specimens are believed to have established following extensive damage to rainforest caused by cyclone

'Winifred' (Stanton *pers. comm.*). Seed was probably blown from the coast to the foothills of the escarpment west of Cairns (Fichera *pers. comm.*). *This* species is much rarer in coastal areas of south-east Queensland. It has also naturalised in Darwin and Gove (Northern Territory) where it occurs in monsoon vine forest (Swarbrick and Skarratt 1994). It has been listed as an environmental weed by Brisbane City Council. Despite its weediness, it is widely grown as a garden ornamental for its spectacular bright red flowers. It is available from nurseries in Queensland (Lawson 1997).

***Syagrus
romanzoffianum***

*Syn. Arecastrum
romanzoffianum*

**cocos palm,
Queen palm**

Family: Arecaceae

A large palm (c. 10-15m) with a single, straight trunk. It reproduces from seeds which are produced in large bunches just below the lowest leaf. It is native to Brazil (Bodkin 1986) and is a very common garden plant throughout the major cities and towns of Australia. Naturalised specimens have been reported to occur in north-eastern New South Wales (Swarbrick and Skarratt 1994) and in urban bushland within the suburbs of Brisbane.

***Synedrella
nodiflora* (L.)
Gaertner.**

nodeweeds

Family: Asteraceae

Synedrella nodiflora is an erect, annual weed up to c. 1m tall. The leaves are hairy, serrate with shallow rounded teeth and arranged in opposite pairs (Kleinschmidt and Johnson 1987). The flowers are small, yellow and arranged in clusters in the leaf axils. The flattened black seeds are winged or have wings reduced to bristles (Kleinschmidt and Johnson 1987). It is a pantropical weed and has been listed as a weed in 34 countries (Holm *et al.* 1979).

In Australia, it is a weed of tropical coastal Queensland, the Atherton Tablelands (Kleinschmidt and Johnson 1987) and in the Darwin and Gulf region of the Northern Territory (Hnatiuk 1990). *S. nodiflora* is unlikely to become a significant environmental weed. It grows thickly on disturbed sites, particularly of cleared rainforest, cultivated lands and plantation (Anon undated, Kleinschmidt and Johnson 1987). It is not a weed of pasture and does not persist under grazing (Kleinschmidt and Johnson 1987). Slashing and cultivation provide good control (Anon. undated).

**Syngonium
podophyllum
Schott**

**arrowhead plant,
goosefoot plant**

Family: Araceae

Syngonium podophyllum is a climbing evergreen plant (Ellison 1995). At least ten cultivars have been developed by the nursery trade for use as indoor plants and garden ornamentals. Leaf colour varies considerably depending on variety. In general, leaves are arrowhead-shaped and glossy. The inflorescence comprises 6 - 9 green tubular-oblong flowers. The plant prefers moist, fertile soil in a shaded position and can be propagated by division (Bodkin 1986). It will grow as an indoor plant in areas with a temperate climate and outdoors in areas with sub-tropical or tropical climates. It is native to central America, from Mexico to Panama, and has been listed as a weed in El Salvador, Guatemala, Honduras and Panama (Holm *et al.* 1979). The only record of naturalisation in Australia is a specimen collected from Bucasia Beach near Rockhampton (Queensland herbarium).

Tamarix aphylla (
L.) Karsten

Syn. *T. articulata*,
T. orientalis

**athel pine,
tmarix, salt cedar**

Family: Tamaricaceae

Tamarix aphylla is a spreading tree reaching 10m in height. The leaves are blue-green and jointed, similar in appearance to pine needles. Flowers are pinkish-white and arranged in spike-like racemes at the ends of the branches (Smith 1995). The plant's life cycle and features have been described by Parsons and Cuthbertson (1992). *Tamarix* taxonomy is complex and confusing because the plants vary widely in growth habit and phenology (NAS 1980). In Australia, *T. aphylla* is sometimes confused with *T. ramosissima*, which has also been commonly planted as a shade and ornamental tree. *T. aphylla* can reproduce from seeds but most spread is via broken living plants that are transported by floodwater (Smith 1995). Although a single tree can produce 500 000 seeds (NAS 1980), the seed is short-lived, lasting only a few weeks (Griffin *et al.* 1989). Established plants can sucker to expand the size of a colony. This species has been transported throughout Australia and planted for shade, to provide ornament and to revegetate degraded areas.

Holm *et al.* (1979) listed *T. aphylla* as a weed in the United States (related species, *T. gallica* and *T. pentandra* were also listed). *Tamarix* spp. were introduced into the United States as ornamentals in the early 1800's, but escaped cultivation in the mid to late 1800's and invaded many river systems, often replacing native vegetation (Frasier and Johnsen 1991). In the western United States, *T. ramosissima*, *T. chinensis* and *T. parviflora* are reported to have replaced most of the native riparian vegetation on some 500 000 hectares (Wilson unpubl.). *Tamarix* were recorded to spread at the rate of 20km/year along the upper reaches of the Colorado and Green Rivers in Colorado (Graf 1978). *Tamarix* cause soil salinisation by extracting soluble salts from the soil and excreting the salts on the leaves; the resulting leaf litter is high in salts and accumulates around the parent trees. The growth of plants up to 50m from *Tamarix* plants can be affected by the salt (NAS 1980). *Tamarix* are phreatophytes and

transpire abundantly. Prolific growth of *Tamarix* can cause significant reductions in the level of ground water.

TT aphylla is native to North Africa and the Middle East (Smith 1995) and is believed to have been first introduced into Australia in about 1930 (Parsons and Cuthbertson 1992). It has been commonly planted throughout Australia but is only naturalised at a few locations. The largest infestation occurs on the Finke River (Northern Territory), which is believed to have spread rapidly following exceptionally high floods in the mid-1970's. Some 400km of the river are affected (Parsons and Cuthbertson 1992) with the most severe infestation located around Horseshoe Bend homestead (Griffin *et al.* 1989). The Todd, Ross and Palmer rivers are being also being invaded (Griffin *et al.* 1989). Along the Finke River, *TT aphylla* has formed monospecific stands at the expense of river red gum (*Eucalyptus camaldulensis* Dehnh. and the coolibah, *E. microtheca* F Muell.)(Parsons and Cuthbertson 1992). In November 1988, several thousand specimens were found at Starvation Lake on Quinyambie Station in South Australia. *TT aphylla* has been identified as a potential problem at only one location in Queensland (in the Flinders River near Hughenden). Several naturalised populations have been recorded in Western Australia (L. Sage, Western Australian herbarium, *pers. comm.*).

TT aphylla has been described as a "significant national-scale threat" to natural ecosystems in Australia and was listed as one of Australia's top environmental weeds (Humphries *et al.* 1991). It is an aggressive, fast growing species which survives in areas where annual rainfall is as low as 100mm (optimum growth is probably at 350-500mm per annum)(NAS 1980). There is little doubt that *TT aphylla* has the potential to become a serious environmental weed along the sandy banks and beds of watercourses throughout arid and semi-arid regions of central Australia. It is well adapted for survival in arid areas; it can tap underground watertables and tolerates high soil salt levels. There is concern that *TT aphylla* could outcompete and replace native gum trees, such as river red gums (*Eucalyptus camaldulensis*), growing in arid and semi-arid, sandy [watercourses](#). *TT aphylla* forms a dense canopy under which native plants do not regenerate. It provides inferior habitat for wildlife. Along the Finke River (Northern Territory), Griffin *et al.* (1989) found that areas dominated by *TT aphylla* supported only a small number of plant species (mainly saltbushes and introduced grasses) whereas nearby sites occupied by native river red gums contained more varied species. In addition, total numbers of birds and reptiles were found to be significantly lower in areas containing *TT aphylla* compared to areas that still supported the river red [gums](#). *TT aphylla* has the potential to threaten ephemeral river systems of central Australia, such as the Hale, Palmer, Stevenson and Todd Rivers, in much the same way as has occurred along the Finke River (Parsons and Cuthbertson 1992). Since *TT aphylla* is known to cause salinisation of the upper soil layers (even on non-saline soils) (NAS 1980) and to lower ground water tables, native plant communities could be severely modified, if not completely destroyed.

Complete eradication of *TT aphylla* would require substantial funding with additional long-term funding for surveys/mapping and follow-up control. The removal of all known cultivated specimens would be a daunting task. Never the less, the plant's potential impact is considered sufficient to justify strategic control and containment and perhaps investigations into biological control.

***Tecoma stans* (L.) Kunth.**

yellow bells

Family: Bignoniaceae

A shrub or small tree native to Central America (Bodkin 1986). It is widely grown in gardens for its large heads of bright yellow trumpet-shaped flowers. Reproduction occurs from seeds. It is recorded as a weed in Argentina, Nicaragua and the United States (Holm *et al.* 1979). Naturalised populations exist in Queensland (Cook, Leichhardt and Moreton regions) (Hnatiuk 1990) in highly disturbed habitats and riparian vegetation. Isolated specimens have been found in native vegetation on coastal sand dunes in south-east Queensland. This species may have the potential to become more abundant in riparian vegetation in eastern Queensland (areas with sub-tropical and tropical climates).

***Thevetia peruviana* (Pers.) K. Schum.**

Syn. T. nerifolia,
Cascabela thevetia (L.)
Lippold.

yellow oleander

Family: Apocynaceae

Thevetia peruviana is a bushy shrub (2-6m tall) native to tropical America. It prefers fertile, well-drained soils, but can survive on most soils. The leaves are glossy and up to 15cm long. The flowers are yellow and about 3cm in diameter. Fruit are yellow berries. It is a very common garden plant in Brisbane and has naturalised' on ex-pasture land on St. Helena Island National Park near Brisbane, at Burleigh Heads and Rockhampton (Queensland). It appears to be an opportunistic plant, largely restricted to heavily disturbed habitats. It is a significant weeds in Timor but has not yet naturalised in Darwin despite being widely cultivated in gardens (Wilson *pers. comm.*).

***Thunbergia alata* Sims**

black-eyed Susan

Family: Acanthaceae

A slender twining vine (up to 4m long) with heart-shaped, triangular leaves and bright orange tubular flowers (with black centres) (Bodkin 1991). It is widely grown in hanging baskets and as a garden ornamental. *T alata* native to South Africa (Wells *et al.* 1986) and has been listed as a weed in Puerto Rico, Costa Rica, Dominican Republic, Fiji, Mauritius and Western Polynesia (Holm *et al.* 1979). Naturalised populations and specimens exist in the Moreton, North Kennedy, Port Curtis, South Kennedy and Wide Bay regions of Queensland and the central and north coasts of New South Wales (Hnatiuk 1990). Although generally considered to be an environmental weed, it tends to be restricted to roadsides and other highly disturbed habitats and does not appear to be as aggressive as *Thunbergia grandiflora* or *T T laurifolia*.

***Wedelia trilobata* (L.) Hitchc.**

Syn. *Silphurn trilobatum*

Singapore daisy

Family: Asteraceae

Wedelia trilobata is a creeping mat-forming perennial herb (c. 10 - 40cm tall). It has creeping, trailing stoloniferous stems up to 2m long which can take root at the nodes. The leaves are opposite, sessile, elliptic to obovate, somewhat fleshy, usually 3-lobed, irregularly toothed, mostly 3-9cm long; sparsely hairy to nearly glabrous. The flowers are bright yellow, about 2cm broad, on stalks up to 4cm long (Batianoff 1991).

WW trilobata is native to the tropics of central America and has naturalised in many wet tropical areas of the world. It has been listed as a weed in Trinidad, Puerto Rico, the Dominican Republic, Jamaica, Panama and Surinam (Holm *et al.* 1979). It can be found on all the main Hawaiian islands (Anon. 1997) and is listed in the United States Federal Noxious Weed Act (Batianoff 1991).

W trilobata is a very common garden ornamental throughout eastern Australia, where it is planted as a hardy ground cover. In Queensland, it has naturalised in most coastal towns from Weipa to the Gold Coast (Batianoff 1991). In south-east Queensland and coastal north New South Wales, it has invaded riparian vegetation and disturbed areas of coastal sand dunes. In the wet tropics region of northern Queensland, the plant is becoming increasingly common along the edges of rainforests, on roadsides and other disturbed areas. The plant thrives in open areas with well-drained, moist soil, but it can tolerate dry periods. It has the ability to colonise new places by spreading from discarded stem cuttings.

***Zebrina pendula*
Schnitzl.**

Syn. *Tradescantia zebrina*

Hort. ex Bosse

**inch plant,
wandering jew**

Family: Commelinaceae

Zebrina pendula is a sprawling herbaceous plant which reproduces from stolons (Wells *et al.* 1986). It belongs to a commonly planted group of ground-covers that have become a major problem in sub-tropical and temperate rainforests (Humphries and Stanton 1992). *Z la* is native to South America and has naturalised in many other subtropical and temperate forests around the world. It is recorded as a weed in Puerto Rico, Colombia, Dominican Republic, Guatemala, Honduras and Jamaica (Holm *et al.* 1979). It has naturalised in north and south-eastern Queensland, on Lord Howe Island and along the central coast region of New South Wales (Hnatiuk 1990). In north Queensland, it has formed dense infestations (up to 1m thick) along the edges of rainforests, particularly near settlements (Humphries and Stanton 1992). Humphries and Stanton (1992) suggest that it is only a matter of time before this weed becomes a major problem in the wet tropics of north Queensland.

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cow itch	180	hymenachne	168
cypress vine	170	Illyrian thistle	121
devil's rope pear	182	imbricate cactus	182
dewberry	128	inch plant	201
dodder	154	Indian gooseberry	123
Dutchman's pipe	95	Indian hawthorn	127
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English broom	154	Japanese ivy	121
English hawthorn	153	Japanese plum	159
English holly	111	kochia	41
English ivy	165	kurnell curse	167
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firebush	49	lamb's tail	93
firethorn	126	laurel clock vine	131
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flame vine	193	lemon vine	52
flax broom	162	leucaena	173
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Manchurian pear	127	poinciana	106
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Mexican daisy	159	Portugese heath	158
Mexican rose	141	purple broom	124
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