

Weed Detection on Farms



A Guide for Landholders

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Disclaimers

Descriptions of herbicide use in this guide are not to be taken as recommendations. Herbicides must only be used in accordance with the recommendations provided on herbicide labels. Landholders are advised to consult with their State or Territory government departments regarding the legal requirements relating to weed control.



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The Rural Futures logo, featuring a stylized sun and wheat stalks.
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Introduction

Weeds constitute a significant cost to Australian landholders each year, both in terms of control and loss of productivity. As custodians for a large part of Australia's landscape, farmers and graziers make an important contribution to the detection and control of weeds.



It is therefore important to understand what constitutes a weed, how weeds spread, the best methods for detecting weeds on your property, and what needs to be done if a new weed is found.

This booklet discusses the significance of weeds to Australian agriculture, and describes the current 'best practice' principles for early detection of weeds on farms.

Much of this information is based on a 2008 national survey of nearly 150 weed inspectors and 570 landholders conducted by the University of New England, which sought to identify 'best practices' currently being employed to detect weeds in Australia. The best practice principles are summarised under six main sections.

- Where should I look for weeds on my farm?
- When should I look for weeds?
- How do I identify an unknown weed or unusual plant?
- How do I collect and preserve a weed specimen for identification?
- What should I do when I find a new weed outbreak?
- How should I control new weed outbreaks?

Considerable information and resources are available for landholders having difficulties detecting or controlling weeds on their properties. Towards the end of this booklet you will find a list of contact details for relevant authorities in your State or Territory, and a list of useful references (weed identification booklets, brochures and websites).

What is a weed?

Weeds are plants that require some form of action to reduce their harmful effects on farmers' livelihoods, the economy, environment, human health and amenity.

Around 28,000 plant species have been introduced into Australia since European settlement. More than 2,770 of these have become naturalised and weedy, of which around 65% are considered a problem for natural ecosystems and about 35% are considered a problem for agricultural systems.

In addition to plants not native to Australia, weeds may include native plants that are growing outside their known natural range.

Some weeds are declared under legislation as requiring control by all landholders. These are usually particularly harmful and have not yet spread far, and so it is in the wider community's best interest if individual landholders are required by law to control these weeds on their land.

Other more widespread weeds may not be declared under legislation, but there is an economic imperative for individual landholders to manage such weeds.



How do weeds spread?

There are many different causes of weed spread. In reality, anything that moves or is moved may cause weed spread.

Such methods of weed spread may include ‘natural’ pathways such as birds, wind, and other animals, as well as ‘human-mediated’ weed spread (either deliberate or accidental) through, for example, the trade in ornamental plants, fodder and construction and landscaping materials, or the contamination of vehicles and livestock. A full list of weed spread methods is included in the table on the following page.

*Pathways **most likely** to spread weeds on farms (in the opinion of survey participants) in order of importance are birds, wind, water, vehicles and machinery, hay and fodder, and livestock.*



Causes of weed spread

Deliberate Spread by Humans

Aquarium plant trade	Through sales at nurseries, pet shops and escape into waterways.
Fodder trade	Sales and planting of fodder plants for livestock grazing.
Food plant trade	Plants grown and promoted as food for humans.
Medicinal plant trade	Plants propagated and sold in nurseries and among alternative medicine enthusiasts.
Ornamental plant trade	Through nursery sales and escape of garden and landscaping plants.
Revegetation and forestry	Planting for soil conservation and to produce timber.

Accidental Spread by Humans

Agricultural produce	Contamination of hay, grain and pasture seed.
Construction and landscaping materials	Contamination of gravel, soil, sand, mulch and turf.
Human apparel and equipment	Attachment of seeds to clothes and footwear.
Livestock movement	Through faeces or attached to livestock such as sheep, cattle, horses and goats.
Machinery and vehicles	Attachment of seeds to passenger vehicles, slashers, farm equipment, boats, and earth moving equipment.
Research sites	Escape from research sites.
Waste disposal	Unsafe dumping of garden refuse and aquarium plants.

Natural Spread

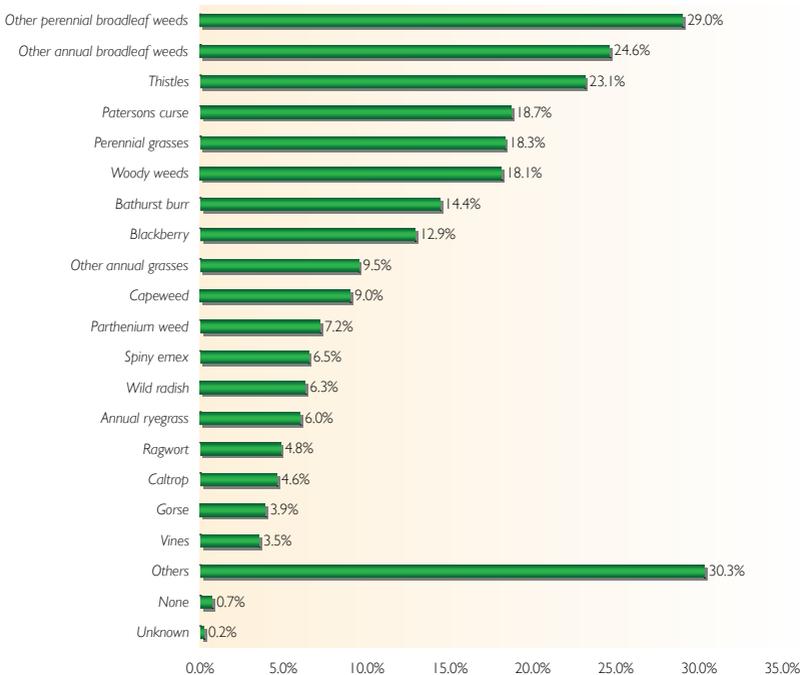
Birds	Through consumption and excretion of seeds and fruits.
Other animals	Through consumption and excretion of seeds and fruits, and external attachment to native and introduced wildlife.
Water	Distribution of seeds or plant parts via waterways.
Wind	Distribution of wind blown seeds.

What weeds are of most concern to farmers?

Which weeds have the greatest impact on individual farms depends on a range of factors including location (region and State or Territory), seasonal conditions, time of year, and type of farm operation.

However, our survey of landholders, with an equivalent number of respondents (over 80) from each State, and over 40 respondents from the Northern Territory, showed that the individual weeds of most concern to landholders nationally are thistles, followed by Paterson's curse, Bathurst burr and blackberry. More general weed groups of most concern are perennial and annual broadleaf weeds, followed by perennial grasses and woody weeds.

Weeds of most concern to farmers



Why is weed detection important?

New weeds continue to enter Australia, whilst existing species spread into new areas, particularly as climate changes. The potential impact of these weeds on the livelihood of farmers is often unknown. However, based on the known costs of current infestations (see quote below), their impact could be devastating.

“Directly or indirectly, all Australians are affected by weeds. For example, landholders and other land managers incur material and labour costs to control weeds. This brings significant flow-on costs to the Australian public who have to pay higher prices for produce. There are also costs associated with illness caused by highly allergenic weeds, and changes in land and water use due to weed infestations. A recent report [by Sinden et al. (2004)] published by the Weeds Cooperative Research Centre (CRC) has established that weeds cost Australia \$4 billion per year in lower farm incomes and higher food costs.” (QNRMW 2006)

The first step in controlling such weedy species is successful detection.

Farmers and graziers, due to the large proportion of Australia owned or managed by them, play an important role in the detection of new weed infestations.



What are the benefits of EARLY detection?

Weeds are only ever very rarely eradicated from an area (reduced to a zero population). Those weeds that have been eradicated have been detected early in their spread.

One example of successful eradication of a new weed is the fast-growing annual weed, kochia (*Bassia scoparia*), which was introduced into the Western Australian wheat belt in 1990 as a forage plant, and for revegetation of salt-affected land. This weed spread from 52 properties to over 270 properties in just two years, with a spread of over 900 km. Early detection of the weed was essential in its eradication within eight years.

Early detection of new weeds may not only prevent costly economic, environmental and human health and amenity impacts in the future, but save hundreds of thousands of dollars on efforts to control them over many years. It is essential to find and eradicate new weeds before they become troublesome. Early detection and prevention is better than cure!



Every dollar invested in the eradication of a newly established weed results in benefits of \$9.90-\$26.80 (NRMMC 2007)

What are the principles of weed detection?

Where should I look for weeds on my farm?

- *Watered areas (water courses and dams)*
- *Roadways and traffic areas*
- *Boundaries and fencelines*
- *Near and downwind of previous weed infestation areas*
- *Livestock camps and feeding areas*
- *Cultivated paddocks*
- *In remote or relatively inaccessible areas*
- *Near sheds, tanks, stock yards and other structures*

The majority of farmers surveyed focus on the above and other specific areas on their property when checking for weeds, given their relative vulnerability to weed spread.

Relatively *inaccessible* areas on your property (such as areas of dense vegetation, remote areas, steep and/or rocky country) may be difficult to check for weeds. Indeed, only 13% of farmers surveyed check these areas regularly. However, it is these areas which often yield new weed infestations, for example, those spread by birds.

Some reduction in the areas to be inspected can be achieved by restricting the movement of newly acquired livestock, in case they are carrying weed seeds (inside or outside). It is also worth restricting the areas where off-farm fodder is distributed, in case it is contaminated.

In practice, it is difficult for many landholders to inspect their entire property for weeds. Therefore, it is important to identify those areas on your particular property which are most vulnerable to new weed outbreaks, and to inspect them for weeds on a regular basis. The places where weeds are most likely to be found vary between regions and property types. For example, water courses are not as important in SA, WA and Tasmania as they are in NSW, Queensland, Victoria and the NT.

When should I look for weeds?

Weed detection becomes a more important issue for farmers at certain times of year. The best time or times of year to look for weeds on your property depends on your climate, and on the type of farm you manage. The best approach is to check your paddocks for weeds while doing other jobs, but also undertake regular specific paddock inspections.

Time of year appears to be less important in Queensland, Tasmania and the NT, possibly due to the relative prevalence of year-round species compared with other States.

WA and SA farmers, and to a lesser extent, Victorian farmers, check for weeds in late autumn after the start of the autumn break (in rainfall) and in early spring when there is still sufficient soil moisture from winter rains and warmer temperatures for weed growth. The best time to check for weeds in the NT appears to be between December and March, and in NSW from October to February.

Why is time of year important for weed detection?

- *Each weed species has a particular life-cycle, and time of year when it is flowering or otherwise producing seed. It is important to detect and control weeds early in their life-cycle, before they produce seed (“one year’s seeding is 7 years weeding!”).*
- *Some weed species are more noticeable at certain times of year.*
- *Often you will have the best chance of killing or controlling weeds, at least with herbicides, when they are young and actively growing.*
- *Seasonal and climatic conditions, such as after rainfall, influence the time of year when weeds are most likely to grow quickly.*
- *Likewise, major disturbances that create bare ground, such as floods, fire, cyclones, drought and overgrazing, and even weed control can result in invasion of weeds.*

It is important to know which weed species are most likely to grow on your land, and be aware of how the factors above will affect the behaviour of these species. A list of weed identification resources is provided at the end of this booklet.

How do I identify an unknown weed or unusual plant?

Landholders undertake a variety of measures when they find an unknown or unusual plant on their property, including:

- asking a local professional such as an agronomist or weeds inspector for advice (see the section *Where can I get further information?*);
- looking the plant up in a weed identification book, a web site, or other reference materials (a list of useful materials is provided at the end of this booklet); and
- asking a neighbour, other landholder or Landcare member for advice.

Landholders are motivated to keep an eye out for and identify any unknown plants as soon as possible, due to concerns about their potential for rapid spread, and the possible financial loss the weeds may cause if they do spread.



Why should I seek advice on unknown plants?

In the event that you find an unknown plant, it is highly recommended that you contact your local weeds inspector or local government office for immediate advice. Weeds inspectors receive training in weed identification, and have access to other weeds identification services including government agencies, agronomists, botanists, and herbaria.

A list of contacts is provided in the section *Where can I get further information?*

How do I collect and preserve a weed specimen for identification?

For proper identification, a flower or other reproductive structure, such as a seed head or fruit, is almost always required. You should therefore aim to collect one or two plants that have these structures on them to take to your local weeds professional for identification. For large weeds, only part of the plant needs to be collected, as long as it contains all the types of structures of the plant. Storing it in a sealed plastic bag will keep it fresh for a day or two for ease of identification.

Where the time between collection and identification is likely to be longer than a day, plants may need to be preserved in their original state by immediately pressing and drying them between sheets of newspaper (4 or 5 at least on each side), with a heavy object on top. It is important to change the newspaper every couple of days until the specimen is dried. The flattened and dried specimen can then be taken for identification as is, or taped to a piece of stiff paper or cardboard for easier display.

Digital photographs can also be taken of your unknown plant and shown or emailed to your weeds inspector for identification. However, these need to include close-ups of all the parts as well as images of the whole plant.



What should I do when I find a new weed outbreak?

When landholders detect new weeds on their property, it is often marked (for example, with a stick, pole, or pile of rocks), recorded in a farm note book or paddock diary, or recorded on a Global Positioning System (GPS) device if the landholder has one.

Again, it is important to notify your local weeds inspector of the outbreak. They will also record the location of the outbreak, and seek to manage the spread of the weed at the regional level.

The aim in marking and recording a weed 'find' is to be able to come back and regularly check the location. It is likely that if one weed is found, more plants will be found at that site in the future, particularly if that plant or another has set seed. The weeds seen above ground may only be 5% of what is there in total. Up to 95% may be seeds on and in the ground.

The time over which weed seeds will persist in the soil varies greatly between species, and so once a new weed is found, the location needs to be marked or recorded in some way and then checked regularly for a period of up to 5 years for new outbreaks, assuming no more seeds arrive at that site in the mean time.



How should I control new weed outbreaks?

There are two primary methods used by farmers to control new weed outbreaks:

- digging or pulling the weed out; and
- spraying the weed as soon as possible.



The control method used depends on the type or types of weeds you are seeking to control, and the time of year. For example, it may be easiest to dig out a small number of thistle plants, to spray a large outbreak of perennial grass weeds, or to burn a large outbreak of blackberry during the cool months of the year.

In general, once weeds have been removed, minimising the disturbance to soil and vegetation will reduce the gaps left for new weed invasions. Weeds love bare ground, so revegetation of the site may be required.

Before starting, it is worth quickly finding out the best way to control particular weed species, and the potential cost involved.

What are my weed control responsibilities?

You may be required by law to inform neighbours or authorities before undertaking control activities, particularly large-scale spraying or burning.

You may also be legally bound to control particular weed species.

If you are unsure of your weed control responsibilities, please seek advice from your local weeds inspector. Legal responsibilities may vary in States, Territories and local government areas.

Where can I get further information?

To obtain further information on weeds on your property please contact your local weeds authority or local government/council, whose contact details should be listed in the ‘White Pages’. Alternatively, a list of State or Territory contacts is provided below. Please be aware that these contact details may have changed since this booklet was produced.

<p>National Department of Agriculture, Fisheries and Forestry Exotic Plant Pest Hotline Phone: 1800 084 881 Web: www.daff.gov.au</p>	
<p>Australian Capital Territory Territory and Municipal Services ACT Parks, Conservation and Lands Phone: 13 22 81 (ACT and NSW residents) 02 6207 5111 (callers outside NSW/ACT) Web: www.tams.act.gov.au/live/environment</p>	<p>South Australia Department of Water, Land and Biodiversity Conservation Animal and Plant Control Group Phone: 08 8463 6800 Web: www.dwlbc.sa.gov.au</p>
<p>New South Wales NSW Department of Primary Industries Weeds Hotline Phone: 1800 680 244 Email: weeds@dpi.nsw.gov.au Web: www.dpi.nsw.gov.au</p>	<p>Tasmania Department of Primary Industries and Water DPIW Switchboard: 1300 368 550 Principal Weed Management Officer Phone: 03 6233 6168 Web: www.dpiw.tas.gov.au</p>
<p>Northern Territory Natural Resources, Environment, The Arts & Sport Weed Management Branch Phone: 08 8999 4567 Email: weedinfo.nretas@nt.gov.au Web: www.nt.gov.au/nreta/natres/weeds/index.html</p>	<p>Victoria Department of Primary Industries Customer Service Centre Phone: 136 186 Email: customer.service@dpi.vic.gov.au Web: www.dpi.vic.gov.au</p>
<p>Queensland Department of Primary Industries and Fisheries Phone: 13 25 33 (Qld residents) 07 3404 6999 (callers outside Qld) Email: callweb@dpi.qld.gov.au Web: www.dpi.qld.gov.au</p>	<p>Western Australia Department of Agriculture and Food Western Australia Phone: 08 9368 3333 Email: enquiries@agric.wa.gov.au Web: www.agric.wa.gov.au/weeds.htm</p>

References and further reading

- Cunningham DC, Brown L (2006), *Some Priority Agricultural Sleeper Weeds for Eradication*. Bureau of Rural Sciences, Canberra.
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- NRMMC (2007), *Australian Weeds Strategy: a National Strategy for Weed Management in Australia*. National Resource Management Ministerial Council, Australian Government Department of the Environment and Water Resources, Canberra.
- QNRMW (2006), *National Weed Spread Prevention Draft Action Plan*. National Weed Spread Prevention Committee, State of Queensland (Department of Natural Resources, Mines and Water), July.
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* **NB.** This is the full report on which this Guide is based. It can be accessed on the websites of:

The Institute for Rural Futures, University of New England
www.ruralfutures.une.edu.au

Land & Water Australia
www.lwa.gov.au

Weed identification resources

Unfortunately no one resource is sufficient for identifying weeds throughout Australia. Most resources have a regional focus. Listed below are some of the more useful books, field guides, web sites and CD based weed identification tools available to Australian landholders.

These resources can be accessed through libraries, the web or purchased through book shops and book sellers, such as through Weed Information, Web <http://www.weedinfo.com.au/default.htm>, Phone (03) 5286 1533.

Your local weed inspector, local government office, State department of agriculture or primary industry, or rural merchandise store may also have a range of weed identification resources available.

Books and field guides

Aquatic Weeds

Waterplants in Australia, by Sainty GR, Jacobs SWL (1994), Sainty and Associates, Darlinghurst.

Tropical and Subtropical Northern Australia

Weeds of the Wet/Dry Tropics of Australia: a Field Guide, by Smith N (2002), The Environment Centre NT, Darwin.

Crop Weeds of Northern Australia, by Wilson BJ, Hawton D, Duff AA (1995), Queensland Department of Primary Industries, Brisbane.

Poisonous Plants: a Field Guide, by Dowling R, McKenzie R (1993), Queensland Department of Primary Industries, Brisbane.

Temperate South Eastern Australia

Environmental Weeds: a Fieldguide for SE Australia, by Blood K (2001), CH Jerram and Associates, Science Publishers, Waverley.

Weeds: an Illustrated Botanical Guide to the Weeds of Australia, by Auld BA, Medd RW (1987), Inkata Press, Butterworth-Heinemann, Melbourne.

Weeds: the Ute Guide, by Cummins J, Moerkerk M (1996), Primary Industries South Australia, Adelaide.

Bush Invaders of South-East Australia, by Muyt A (2001), RG and FJ Richardson, Meredith, Victoria.

Crop Weeds, by Wilding JL, Barnett AG, Amor RL (1986), Inkata Press, Melbourne.

More Crop Weeds, by Moerkerk MR, Barnett AG (1998), RG and FJ Richardson, Meredith, Victoria.

Weeds of the South East: an Identification Guide for Australia, by Richardson FJ, Richardson RG, Shepherd RCH (2006), RG and FJ Richardson, Meredith, Victoria.

Field Guide to Weeds in Australia, by Lamp C, Collet F (1989), Inkata Press, Melbourne.

Grasses of Temperate Australia: a Field Guide, by Lamp CA, Forbes SJ, Cade JW (2001), C.H. Jerram and Associates, Science Publishers, Waverley.

Western Australia

Western Weeds: a Guide to the Weeds of Western Australia, by Hussey BMJ, Keighery GJ, Cousens RD, Dodd J, Lloyd SG (1997) The Plant Protection Society of Western Australia, Victoria Park.

Semi-arid and Arid Australia

Plants of Western New South Wales, by Cunningham GM, Mulham WE, Milthorpe PL and Leigh JH (1992), Inkata Press, Butterworth Heinemann, Melbourne.

Plant Identification in the Arid Zone, by Milson J (1996), Queensland Department of Primary Industries, Brisbane.

CDs

Declared Plants of Australia - An identification and information system for declared weeds. <http://www.cbit.uq.edu.au/software/declaredplants/default.htm>

Crop Weeds of Australia (Educational Version) - A crop weed identification and information tool for students. <http://www.cbit.uq.edu.au/software/cropweedsaust/>

Environmental Weeds of Australia - An interactive identification and information resource for over 1000 invasive plants. <http://www.cbit.uq.edu.au/software/enviroweeds/>

Web sites

Weeds Australia <http://www.weeds.org.au/>

Weeds CRC http://weeds.crc.org.au/index_flash.html

National priority weeds

The next three pages include lists of nationally agreed priority weeds. Species in the Weeds of National Significance list were selected based on their high rankings for invasiveness, potential to spread, and impact on socio-economic and environmental assets. The weeds on the Environmental Alert List are in the early stages of establishment and have the potential to become a significant threat to biodiversity if they are not managed. Species on the Priority Agricultural Sleeper Weeds for Eradication list have potential to cause significant national effects on agriculture if they are allowed to spread. Other weeds will be important at a regional scale. Please check with your weeds inspector as to priority weeds in your region.

Weeds of National Significance

Common Name	Scientific Name
Alligator weed	<i>Alternanthera philoxeroides</i>
Athel pine	<i>Tamarix aphylla</i>
Bitou bush / Boneseed	<i>Chrysanthemoides monilifera</i>
Blackberry	<i>Rubus fruticosus</i> agg.
Bridal creeper	<i>Asparagus asparagoides</i>
Cabomba	<i>Cabomba caroliniana</i>
Chilean needle grass	<i>Nassella neesiana</i>
Gorse	<i>Ulex europaeus</i>
Hymenachne	<i>Hymenachne amplexicaulis</i>
Lantana	<i>Lantana camara</i>
Mesquite	<i>Prosopis</i> spp.
Mimosa	<i>Mimosa pigra</i>
Parkinsonia	<i>Parkinsonia aculeata</i>
Parthenium weed	<i>Parthenium hysterophorus</i>
Pond apple	<i>Annona glabra</i>
Prickly acacia	<i>Acacia nilotica</i> ssp. <i>indica</i>
Rubber vine	<i>Cryptostegia grandiflora</i>
Salvinia	<i>Salvinia molesta</i>
Serrated tussock	<i>Nassella trichotoma</i>
Willows except weeping willows, pussy willow and sterile pussy willow	<i>Salix</i> spp. except <i>S. babylonica</i> , <i>S. x calodendron</i> and <i>S. x reichardtjii</i>

Source: www.weeds.org.au/docs/WoNS/

Weeds on the Environmental Alert List

Common Name	Scientific Name
Barleria or porcupine flower	<i>Barleria prionitis</i>
Blue hound's tongue	<i>Cynoglossum creticum</i>
Cane needle grass	<i>Nassella hyalina</i>
Chinese rain tree	<i>Koelreuteria elegans</i> ssp. <i>formosana</i>
Chinese violet	<i>Asystasia gangetica</i> ssp. <i>micrantha</i>
Cutch tree	<i>Acacia catechu</i>
Cyperus	<i>Cyperus teneristolon</i>
False yellowhead	<i>Dittrichia viscosa</i>
Garden geranium	<i>Pelargonium alchemilloides</i>
Heather	<i>Calluna vulgaris</i>
Holly leaved senecio	<i>Senecio glastifolius</i>
Horsetails	<i>Equisetum</i> spp.
Karoo thorn	<i>Acacia karroo</i>
Kochia	<i>Bassia scoparia</i>
Lagarosiphon	<i>Lagarosiphon major</i>
Laurel clock vine	<i>Thunbergia laurifolia</i>
Leaf cactus	<i>Pereskia aculeata</i>
Lobed needle grass	<i>Nassella charruana</i>
Orange hawkweed	<i>Hieracium aurantiacum</i>
Praxelis	<i>Praxelis clematidea</i>
Rosewood or tipuana tree	<i>Tipuana tipu</i>
Senegal tea plant	<i>Gymnocoronis spilanthoides</i>
Siam weed or chromolaena	<i>Chromolaena odorata</i>
Subterranean Cape sedge	<i>Trianoptiles solitaria</i>
Uruguayan rice grass	<i>Piptochaetium montevidense</i>
White Spanish broom	<i>Cytisus multiflorus</i>
White weeping broom	<i>Retama raetam</i>
Yellow soldier	<i>Lachenalia reflexa</i>

Source: www.weeds.gov.au/weeds/lists/alert.html

Priority Agricultural Sleeper Weeds for Eradication

Common Name	Scientific Name
Badhara bush	<i>Gmelina elliptica</i>
Brillantaisia	<i>Brillantaisia lamium</i>
Chilean dodder	<i>Cuscuta suaveolens</i>
Chilquilla	<i>Baccharis pingraea</i>
Chinese violet	<i>Asystasia gangetica</i> ssp. <i>micrantha</i>
Common crupina	<i>Crupina vulgaris</i>
Creeping yellowcress	<i>Rorippa sylvestris</i>
Lobed needle grass, Uruguay needle grass	<i>Nassella charruana</i>
Mallee cockspur	<i>Centaurea eriophora</i>
Meadow parsley, Water dropwort	<i>Oenanthe pimpinelloides</i>
Orange hawkweed	<i>Hieracium aurantiacum</i>
Pannicle joint vetch	<i>Aeschynomene paniculata</i>
Parodi spike rush	<i>Eleocharis parodii</i>
Snake cotton	<i>Froelichia floridana</i>
Square-stalked St John's wort	<i>Hypericum tetrapterum</i>
Tuarian thistle	<i>Onopordum tauricum</i>
Uruguayan rice grass	<i>Piptochaetium montevidense</i>

Sources: Cunningham and Brown (2006), Cunningham et al. (2003)

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