

Weed Detection and Control on Small Farms



A Guide for Owners

Brian Sindel & Michael Coleman

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Brian Sindel, School of Environmental and Rural Science, and Michael Coleman, Institute for Rural Futures, University of New England.

Contact

Professor Brian Sindel, Agronomy and Soil Science, School of Environmental and Rural Science, University of New England, Armidale, NSW, Australia 2351; 02 6773 3747; bsindel@une.edu.au

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.



Australian Government
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Introduction

Weeds constitute a significant cost to Australian agriculture each year, both in terms of control and lost productivity. However, weeds also cause problems for the owners of small 'hobby' or lifestyle farms.

Apart from the legal obligation to control certain weeds, extensive weed outbreaks on small farms may:

- impact on biodiversity and human health;
- spread to neighbouring land, including production farms, which in turn may strain community relationships;
- cut significantly into niche-farming profits;
- detract from time better spent on other activities;
- make it more difficult to restore natural habitats on your land;
- detract from the natural beauty of your land and reduce its value;
- increase farm costs;
- be toxic or harmful to livestock and pets;
- harbour feral animals such as rabbits and foxes; and
- make it difficult to access certain areas of your farm.

The primary emphasis of this booklet is on *the importance of detecting and controlling weeds on your land before they have a chance to spread*. It is also important to *seek advice and assistance from your local weeds officer*, and, when necessary, to *work with your neighbours to control weeds*. In the longer term, effective and diligent weed control will make managing your farm easier and less time-consuming, and will allow you to focus on the enjoyable aspects of living in rural Australia.

In the following pages we discuss the significance of weeds to small farms in Australia, and summarise best practice weed detection and control methods most appropriate to small farm owners. Much of this information is based on a 2008 national survey of weed officers and landholders.

It is important to understand the ‘principles’ of weed detection and control: what constitutes a weed, how weeds spread, where and when to look for weeds on your land, how to detect weeds and identify unknown species, and the best methods to control weed outbreaks *quickly*.

Considerable information, assistance and resources are available to help landholders control weeds on their properties. For small farm owners, however, external assistance can be expensive, difficult to access, or more appropriate to large-scale production agriculture.

Therefore, towards the end of this booklet, options for small farm owners seeking assistance with weed control are discussed. You will also 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 may not yet have 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 and environmental imperative for individual landholders to manage such weeds.

Each weed species may pose a threat to different regions or parts of Australia, depending on factors such as climate and the extent to which the weed has taken hold in a region. Some species may be declared or prohibited at a State/Territory or Federal level, while others may only be prohibited at a regional level (for example, a catchment or local government area).

To obtain a list of declared species for your region, contact your local weeds officer, weeds authority, council/local government office, or your State or Territory department of agriculture or primary industries. A list of weed identification resources is also included on pages 26 and 27.

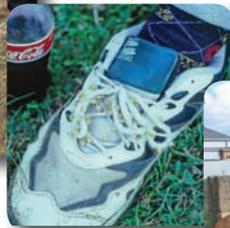
How do weeds spread?

There are many different causes of weed spread. In reality, anything that moves or is moved may cause weeds to spread. Seventeen 'pathways' of weed spread have been identified in Australia (Sindel *et al.* 2008b).

- *Deliberate spread by humans:* aquarium plant trade, fodder trade, food plant trade, medicinal plant trade, ornamental plant trade, revegetation and forestry.
- *Accidental spread by humans:* agricultural produce, construction and landscaping materials, human apparel and equipment, livestock movement, machinery and vehicles, research sites, waste disposal.
- *Natural spread:* birds, other animals, water, wind.

The pathways most likely to spread weeds on farms include birds, wind, water, machinery and vehicles, hay and fodder, and livestock.

On small farm blocks, other pathways including ornamental plant trade (gardens and exotic tree plantings), food plant trade (orchards and vegetable gardens) and landscaping materials (mulches, gravel and topsoils) will also be important.



Minimising weed spread on your property

By identifying the potential ways in which weeds may spread onto your property, you may be able to implement some simple measures to reduce the appearance of new weeds in your paddocks or garden, or minimise the spread of weeds from one area of your property to another.

The best way to minimise weed spread onto other parts of your property, or onto neighbouring properties, is to eradicate the weeds at the source as soon as possible. In the longer term, you will have less weeds to remove, and will generally have to remove them from fewer locations.

Some reduction in the spread of weeds on your farm 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 fed to livestock, in case it is contaminated.

Other measures to prevent weeds spreading onto your land may include ensuring that potential weed species are not planted in the garden, removing garden plants that appear to be spreading into the paddocks, purchasing stock fodder that has been certified weed-free, ensuring your vehicles, or contractor vehicles, do not carry weed seeds onto your property from another recently visited property, or ensuring that seed attached to your clothing is removed and destroyed.

When you have determined which weed species are prevalent on your land or in your district, it is worth seeking advice from your local weeds officer to determine what can be done to limit the spread of these particular species.

Why is it important to control weeds on small farms?

Given the estimated cost of weeds to Australian agriculture of \$4 billion annually (Sinden *et al.* 2004), the focus of weeds professionals and agencies is largely on the economic benefits of controlling weeds to maximise farm profits, on the legal requirements of controlling prohibited or declared species, or on biosecurity.

However, most small farm owners have purchased land not to make a profit, but to realise a variety of non-economic 'lifestyle' goals, including habitat restoration, self-sufficiency, family well-being, involvement in a rural community, and/or small-scale hobby farming (Hollier and Reid 2007).

Many small farm managers in Australia are keen to do more to control weeds on their land. Where small farm managers are unable to control weeds effectively, it is mostly due to lack of time, knowledge, or equipment, rather than lack of motivation (Low Choy and Harding 2008).

Early weed detection and on-going control is vital to effective land management on a small farm, and may prevent costly economic, environmental and human health and amenity impacts in the future. It is essential to find and eradicate new weeds *before* they become troublesome. Early detection and prevention is better than cure!

Keeping the weeds on your land under control will help you to enjoy your farm and get the most out of it. An extensive weed outbreak on your property will be expensive and time-consuming to control, may strain relationships with your neighbours, and will make it difficult to achieve other goals such as hobby farming or habitat restoration.

Being diligent in detecting and controlling weeds will minimise the chance of a large outbreak, will save you time and money, and will help you to enjoy the benefits of a rural lifestyle.

The first step in controlling weeds is successful detection. In the next few pages we summarise 'best practice' principles for detecting weeds on your farm.

What are the principles of weed detection?

Where should I look for weeds on my farm?

- Near and downwind of previous weed infestation areas
- Watercourses and dams, particularly after floods
- Roadways and traffic areas
- Areas in which earthmoving and other contractors have been working
- Boundaries with neighbours and along fencelines
- Livestock camps and feeding areas
- Newly sown crop and pasture paddocks
- In remote or relatively inaccessible areas (such as remnant bushland)
- Near sheds, tanks, stock yards and other structures
- Revegetation areas (e.g. tree plantings) and gardens (particularly new gardens where mulch or topsoil has been used)

When determining where on your property to check for weeds, consider:

- those areas that have had weed infestations in previous seasons (*seeds can often persist in the soil for many years*); and
- focusing on areas on your property that may be particularly vulnerable to new weed infestations, such as those listed above (*identify these areas and inspect them for weeds on a regular basis*).

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. However, it is these areas which often have new weed infestations, for example, those spread by birds. On a small farm, it may be more practical to inspect difficult areas on foot, horseback, motorbike or quad bike, and to inspect other areas using a vehicle.

If you are new to your property, or are not certain which areas may be most vulnerable to weeds, you should ask your local weeds officer, agronomist, or your neighbours for advice. The parts of a property where weeds are most likely to be found vary across Australia.

When should I look for weeds?

Weed detection becomes a more important issue at certain times of year. The best time or times of year to look for weeds on your property will depend on the climate, the species of weeds prevalent in the district, and the type of farm you own.

For example, farmers in southern regions with a typical Mediterranean-type climate will check for weeds after the start of the autumn 'break' (first rains after a typical dry summer), or in early spring when there is still sufficient soil moisture from winter rains and warmer temperatures for weed growth. In northern monsoonal Australia, weeds will be best detected over the wet summer. However, in other parts of Australia, such as the subtropics and arid inland, time of year may be less important, due to relatively warmer temperatures, rainfall occurring at any time throughout the year, or the relative importance of year-round species.

The best approach is to check your property for weeds while doing other jobs, but also to undertake regular specific paddock inspections.



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 producing seed. It is important to detect and control weeds early in their life-cycle before they produce seed (there is a well known saying that "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, particularly 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 activity (such as spraying of herbicide) can contribute to weed infestation.*

It is important to know which weed species are most likely to grow on your land, and to be aware of how the factors above will affect the growth of these species. A list of weed identification resources is provided at the end of this booklet. Your State department of agriculture or primary industries, or weeds officer may also be able to provide fact sheets or further information on when specific weed species are likely to grow.



How do I identify an unknown weed or unusual plant?

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

- asking a local professional such as a weeds officer or agronomist for advice (see the section *Where can I get further information?*) – best option;
- using a weed identification book, a web site, or other reference materials (a list of useful materials is provided at the end of this booklet) – a good starting point then confirm by using professional identification service or weeds expert; and
- asking a neighbour (particularly one who is an experienced farm manager), other landholder or Landcare member for advice – a good starting point then follow if unsure with weed professional or identification service.

Noting the conditions in which the plant was growing, e.g. a wet area in a grazed paddock, can sometimes assist these people in identifying the plant.

It is important to identify an unknown or previously unseen plant on your land as soon as possible, to determine whether it is a weed and how to control it. If the plant is a weed, early identification and removal will give you the best chance of controlling the weed before it has a chance to spread and become a larger problem next season.

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 officer or local government office for immediate advice. Weeds officers receive training in weed identification, and have access to other weed identification services including government agencies, agronomists, botanists, and herbaria. They can also provide you with information on the high priority weeds for which you should be looking.

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 part of the plant, for example, a fruit that contains the seed, 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, for example, leaves, stems, flowers and fruit. Storing the plant in a sealed plastic bag in a cool place out of the sun or in the fridge will keep it fresh for a day or two for ease of identification, and also eliminate the chance of seed spread.

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 officer for identification. However, these need to include close-ups of all the parts as well as images of the whole plant. Photographs may also be preferable over a plant specimen when there is only one plant in the field (it could be a rare native species that requires protection) or when the weeds are seeding and there is a chance of weed spread if the plant is moved.



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



When farmers detect new weeds on their property, they are often marked (for example, with a stick, pole, or pile of rocks), or recorded in a farm note book or paddock diary if the farmer has one.

Once you have identified the plant, and if it is considered to be a serious weed, then it is important to notify your local weeds officer of the outbreak. They will 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.

The most important action to take when finding a new weed outbreak on your property is to control the weeds as soon as possible. In the next section of this booklet we discuss appropriate weed control methods for small farm owners.

Controlling weed outbreaks on your farm

What are my weed control responsibilities?

There are many personal benefits for managers of small farms in controlling weeds as described earlier, but you also have a legal responsibility to the broader community to control weeds that are declared or prohibited under legislation that may spread and cause havoc elsewhere (lists of declared or prohibited weeds vary across Australia). It is advisable to control all weeds along property boundaries whether they are declared or not, simply to be a good neighbour and to avoid disputes about weed spread from one property to another.

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

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

Which control methods are suitable for small farm owners?

Experience shows that those farmers who have a plan (Deliberation), in which they integrate several control methods (Diversity), and with which they persist over many years (Dedication), are the ones most likely to have success in controlling weeds. In applying this '3D' approach, the two primary methods used by the majority of small farm owners to control new weed outbreaks are digging or pulling the weed out; and spraying the weed with a herbicide. However, there is also a variety of other options for weed control.

The control methods used will be dictated by the type or types of weeds you are controlling (hence accurate identification is important), their growth stage, the size of the infestation, the situation or site you are

controlling in, and the resources you have available. State and Territory departments overseeing agriculture and primary industries produce a series of weed management guides for particular species, usually available for free download from the web. Your local weeds officer or district agronomist will also be able to advise you on the best way to manage particular species in your region.

Some of the more common weed control methods for small farms are described below.

Farm hygiene

Good farm hygiene practices aim to stop weed seeds from ever entering your farm. You can do this, for example, by only buying weed-free hay and only feeding out hay in areas that can be regularly checked for weed growth in case the hay is contaminated with weed seeds.

Digging and pulling

Small numbers of weeds can be dug or chipped out with a hoe or pulled out by hand, but if they are setting seed then they should be bagged and burnt once the plants are dry. Gloves may be required for weeds like thistles and Bathurst burr that have sharp spines or for other weeds that may be poisonous (for example, Parthenium weed and some spurges). Broadcasting pasture seeds onto the site where weeds have been removed will help to outcompete weeds that may germinate there in the future (see following page).

Slashing and mowing

Slashing or mowing before plants set seed can be used to help control larger outbreaks of certain weeds in a pasture environment, particularly annuals that have a limited ability to reshoot once cut, such as several thistle species. Caution must be taken as slashing and mowing can also be a very effective means of spreading weeds especially perennial grasses. Ensure no seed are attached to the plants before using this method.

Outcompeting weeds

The best way to control weeds in a pasture is to promote the growth of desirable pasture plants so that they outcompete the weeds for water, nutrients and light. This may involve timely fertilizer application and/or irrigation at the start of the active growth period of the pastures. Where there is bare ground or gaps in the pasture, weeds will thrive. Consequently, these areas may need to be resown with seed of vigorous pasture plants. One sure way to promote pasture growth is to not graze your pastures too heavily (i.e. with too many animals), and to allow your pasture plants to set seed (often in summer) to fill in the pasture gaps with new seedlings. An ideal pasture mix, where climatic conditions allow it, will contain a mixture of perennial grasses and clovers.

Grazing

While most livestock avoid grazing unpalatable and toxic weeds in pastures, they can sometimes be encouraged to be less selective, and to eat and trample the less palatable non-toxic species, by running them in paddocks in large numbers for a short period of time. If timed correctly, such grazing can restrict the ability of weeds to set seed or otherwise propagate. Goats will selectively eat some weed species, such as blackberry, but unless a farm is set up to run goats, they can be difficult to contain. However, selective grazing with goats is a potentially useful method for controlling weeds on areas of your property that are difficult to access.



Mulching

Mulching with either a synthetic or natural organic mulch can suppress weed growth in gardens, orchards and other areas used to grow a variety of crops. Mulches act to cut out light to germinating seedlings, and provide a physical barrier to weed emergence.

Spraying with herbicide

There are two broad categories of herbicides. ‘Selective’ herbicides will kill certain target weeds but cause little damage to other weeds and certain desirable species. In contrast, ‘non-selective’ herbicides, such as the commonly used glyphosate, will kill most plants with which it comes in contact. It is particularly important, therefore, when using non-selective herbicides, to apply the chemical only to the target weed to avoid damage to surrounding vegetation.

Small outbreaks of weeds may be ‘spot sprayed’, often with a non-selective herbicide, using a backpack or handheld spray applicator. However, larger outbreaks of difficult-to-control weeds, such as perennial weedy grasses, may best be sprayed with a selective herbicide (registered for that weed and situation) using a vehicle mounted ‘boom’ applicator. Larger woody shrub weeds may need to be cut at ground level and the cut stem treated immediately with a suitably registered herbicide.

Bringing the control methods together

Farmers will combine these and other weed control methods in various ways. For example, in pastures, the first aim may be to remove existing weeds using methods known as ‘weed removers’. Digging or pulling weeds out, or spot-spraying weeds are frequently the quickest and most economic methods for small farm owners, given the small scale of weed outbreaks they generally face. If you check your property regularly and thoroughly for weeds, and remove them as soon as possible (especially before they have had a chance to set seed), these simple control methods should remain applicable. The second aim may then be to make the pasture more resilient to future weed invasion by filling in gaps and promoting its growth using methods known as ‘pasture improvers’ (see *Outcompeting weeds* above).

A word on biological control

Biological control involves government agencies introducing to Australia 'natural enemies' of a particular weed, such as fungal pathogens or insects, from where the weed originated overseas. This has been done occasionally with spectacular success. But in *most* cases, biological control agents will only suppress growth and/or flowering, and will not achieve sufficient control alone. They therefore need to be integrated with other methods to achieve effective weed control.

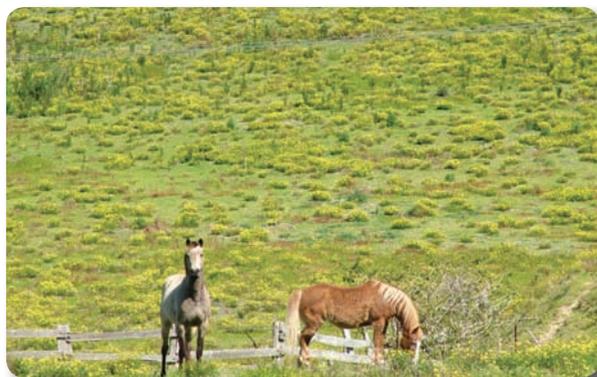
While it is worthwhile finding out from your local weeds officer if biological control agents are available for you to establish in your weed infestation, you must realise that biological weed control programs are no 'silver bullets' for success and have largely only been introduced for some perennial non-grass weeds in aquatic, pasture, and rangeland habitats.

Further information on biological control options is available from the Australian Government web page *Weeds in Australia: Biological control* – www.weeds.gov.au/management/biological-control.html



How do I control large-scale weed outbreaks?

In some cases, you may be faced with a large weed control task that is too difficult to manage without help or expensive equipment. However, large-scale outbreaks often involve a number of neighbouring properties, particularly where there are a number of adjoining small farms. By joining together with your neighbours to control the same weed, you can share the associated labour and costs, and possibly even share equipment if, for example, one neighbour has a large sprayer. Local Landcare volunteers may also be able to assist, particularly if you intend to control large weed outbreaks as a step towards revegetation or environmental restoration works on your property.



Using accredited subcontractors

For small farm owners who may be time-poor, using a subcontractor for weed control may be an attractive option. Combining resources with your neighbours may make employing a spray contractor more affordable. When employing a contractor, ensure that they have the correct licencing and/or accreditation. Requirements vary across Australian States and Territories, so if you are not sure, contact your local weeds officer or authority for advice. They should be able to recommend a contractor, and may even be able to undertake the work themselves.

What are the guidelines for responsible use of herbicides?

Herbicides must be used in accordance with the instructions included on the label or packaging. You must always follow these instructions, as they maximize your chance of success, and it is illegal to do otherwise. It is important to wear appropriate protective clothing when using herbicides, which may include a long sleeved shirt and long pants, waterproof gloves, heavy duty shoes, eye protection and a respirator. Care is also needed to prevent herbicide spray droplets from drifting onto non-target vegetation and neighbours' properties and to protect the environment, such as watercourses, from chemical contamination. Drift can largely be avoided by not spraying in windy conditions and by adjusting your spray nozzle so that it does not produce fine, misty (small) spray droplets.

You may also be obliged by State or Territory legislation to undergo training and obtain accreditation or certification in correct chemical safety, handling, application and record-keeping procedures. Some States or Territories only require accreditation for those who use more than a certain amount of chemicals annually (although these requirements may have changed since this booklet was published). Several organisations offer accreditation or certification courses. See the section *Chemical certification or accreditation* for contact details.

You may also be required to keep records of chemical use on your property to comply with legislation or quality assurance programmes, such as the Livestock Production Assurance programme administered by Meat & Livestock Australia. If you participate in any quality assurance or primary production accreditation programmes, make sure you understand the requirements relating to chemical use. Organisations administering these programmes, or local weeds officers, will be able to provide advice on how chemical use records must be kept.

Chemical certification or accreditation

Short courses such as those developed by SMARTtrain or ChemCert Australia teach participants appropriate chemical storage, use and safety. Once you have completed the course, you will obtain accreditation in chemical use on farm, appropriate to your State or Territory's legal requirements. Ongoing accreditation may require participation in refresher courses after a set period (e.g. five years).

Training may be available from your State or Territory farmers association, TAFE, or other local provider. Your department of agriculture or primary industries, or your local weeds officer, should be able to advise you where training is available locally.

Alternatively, the SMARTtrain National Support Centre (freecall 1800 138 351) or ChemCert Australia (02 9387 4714) will also advise you on your responsibilities, where training is available locally, and on the form of accreditation required in your State or Territory.

What assistance is available to control weeds on my land?

Personal assistance

Weeds officers are responsible for weed detection and control within a district, but are also available to help all farmers, including small farm owners, to manage weeds on their land. They will be able to advise you on the most effective methods to control weeds. *If you need assistance or advice on weed control, your local weeds officer is the best first contact.* Your local government office or State/Territory government will be able to advise you who to contact locally.

Many rural merchandise stores now employ agronomists, who may also be able to offer you advice on controlling particular weed species. Your State or Territory government may also employ local or district agronomists. A list of State and Territory contacts is given in the section *Where can I get further information?*

Your neighbours may also be a useful source of assistance and advice. It may be in the best interests of neighbouring farmers (particularly commercial farmers) to see that weeds are kept under control in their district, as rapidly spreading weed infestations may impact on their farm's profitability. Whether they are prepared to help you manage weeds on your land will depend on the individuals concerned.



Financial assistance

Depending on the extent of the weed problem on your property, and the weed species involved, you may be able to obtain a grant to undertake control activities. Funding may be available from a range of sources, including various community and environmental grants from local, State, Territory, and Federal government, Landcare Australia, or regional natural resource management bodies (such as Catchment Management Authorities - CMAs).

Your chance of obtaining a grant to control weeds may increase if you apply for funding in conjunction with neighbours, if you are seeking to control prohibited or high priority weed species, or if the weed control work coincides with habitat restoration (such as revegetation or tree planting).



A list of possible funding providers is available on the following two web pages:

- www.weeds.gov.au/government/programmes/index.html
- www.weeds.org.au/weedfunding.htm

For advice on Australian Government funding sources, phone the Commonwealth Regional Information Service on 1800 026 222.

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 <i>Department of Agriculture, Fisheries and Forestry</i> <i>Exotic Plant Pest Hotline</i> Phone: 1800 084 881 Web: www.daff.gov.au</p>	
<p>Australian Capital Territory <i>Territory and Municipal Services</i> <i>ACT Parks, Conservation and Lands</i> Phone: 13 22 81 or 02 6207 5111 Web: www.tams.act.gov.au/live/environment</p>	<p>South Australia <i>Department of Water, Land and Biodiversity Conservation</i> <i>Animal and Plant Control Group</i> Phone: 08 8463 6800 Web: www.dwlbc.sa.gov.au</p>
<p>New South Wales <i>Industry and Investment New South Wales</i> <i>Weeds Hotline (new weed incursions)</i> Phone: 1800 680 244 Email: weeds@dpi.nsw.gov.au Web: www.dpi.nsw.gov.au/weeds</p>	<p>Tasmania <i>Department of Primary Industries and Water</i> DPIW Switchboard: 1300 368 550 Principal Weed Management Officer Phone: 03 6233 6168 Web: www.dpiw.tas.gov.au</p>
<p>Northern Territory <i>Natural Resources, Environment, The Arts & Sport</i> <i>Weed Management Branch (Darwin)</i> Phone: 08 8999 4567 Email: weedinfo.nretas@nt.gov.au Web: www.nt.gov.au/nreta/natres/weeds/index.html</p>	<p>Victoria <i>Department of Primary Industries</i> <i>Customer Service Centre</i> Phone: 136 186 Email: customer.service@dpi.vic.gov.au new.landholders@dpi.vic.gov.au Web: www.dpi.vic.gov.au</p>
<p>Queensland <i>Department of Primary Industries and Fisheries</i> Phone: 13 25 33 or 07 3404 6999 Email: callweb@dpi.qld.gov.au Web: www.dpi.qld.gov.au</p>	<p>Western Australia <i>Department of Agriculture and Food Western Australia - Small Landholder Information Service</i> Phone: 08 9368 3807 or 08 9733 7777 Email: Small_Landholder@agric.wa.gov.au Web: www.agric.wa.gov.au/</p>

References and further reading

- Department of Agriculture and Food, Western Australia (2003), *Biosecurity for Small Landholders*, Bulletin No. 4573, available from www.agric.wa.gov.au
- Department of Agriculture and Food, Western Australia (2006), *The Land is in Your Hands*, Bulletin No. 4686, available from www.agric.wa.gov.au
- Department of the Environment, Water, Heritage and the Arts (2007), *Weeds in Australia: How You can Help – Hobby Farmers*, www.weeds.gov.au/help/hobby.html
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- Department of Primary Industries, Victoria (2007), *How to Manage Weeds*, Information Note LC0172, available from www.dpi.vic.gov.au
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- North East Catchment Management Authority (2004), *A Resource Guide: Managing Your Rural Property*, Department of Primary Industries, Victoria and North East Catchment Management Authority, Rutherglen.
- Nursery & Garden Industry Australia (2009), *Grow Me Instead: A Guide for Gardeners in New South Wales*, NGIA and Department of Environment, Water, Heritage and Arts, Canberra.
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- Sindel B, Jhorar O, Reeve I, Thompson L, Moss J, Coleman M (2009), *Weed Detection on Farms: A Guide for Landholders*, University of New England, Armidale.*
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- * These documents, on which this booklet is based, are available from www.ruralfutures.une.edu.au

Weed identification resources

No one resource is sufficient for identifying weeds throughout Australia. Most resources have a regional focus. Your local weeds officer, local government office, State department of agriculture or primary industry, or rural merchandise store are likely to have a range of weed identification resources available. Weed identification training may also be available in your area, so ask your local weeds officer.

Listed below are some of the more general 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>, phone (03) 5286 1533.

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), CH 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

Australian Government <http://www.weeds.gov.au/>

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

Weed outbreak record

The following two pages can be used to record weed outbreaks on your farm. Alternatively, you can adapt this table into a farm notebook, or computer spreadsheet or database, to suit your requirements. More information on weed marking and recording may be found in the section *What should I do when I find a new weed outbreak?*

Species	Location (e.g. paddock)	How outbreak marked (e.g. stick, pole, rock pile)	Date controlled and how	When to check location again (e.g. Spring)

Species	Location (e.g. paddock)	How outbreak marked (e.g. stick, pole, rock pile)	Date controlled and how	When to check location again (e.g. Spring)

To obtain an electronic copy of this booklet, please visit:

www.ruralfutures.une.edu.au



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