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Managing weeds in riparian areas

This fact sheet has been prepared through the Land, Water & Wool Program and provides advice for woolgrowers on managing weeds in the mid north grasslands and shrublands of South Australia. The fact sheet summarises information about weeds, their prevention and management, so that woolgrowers can make informed decisions about what to do on their property.

Pepper tree fruit. Photo Roger Charlton.



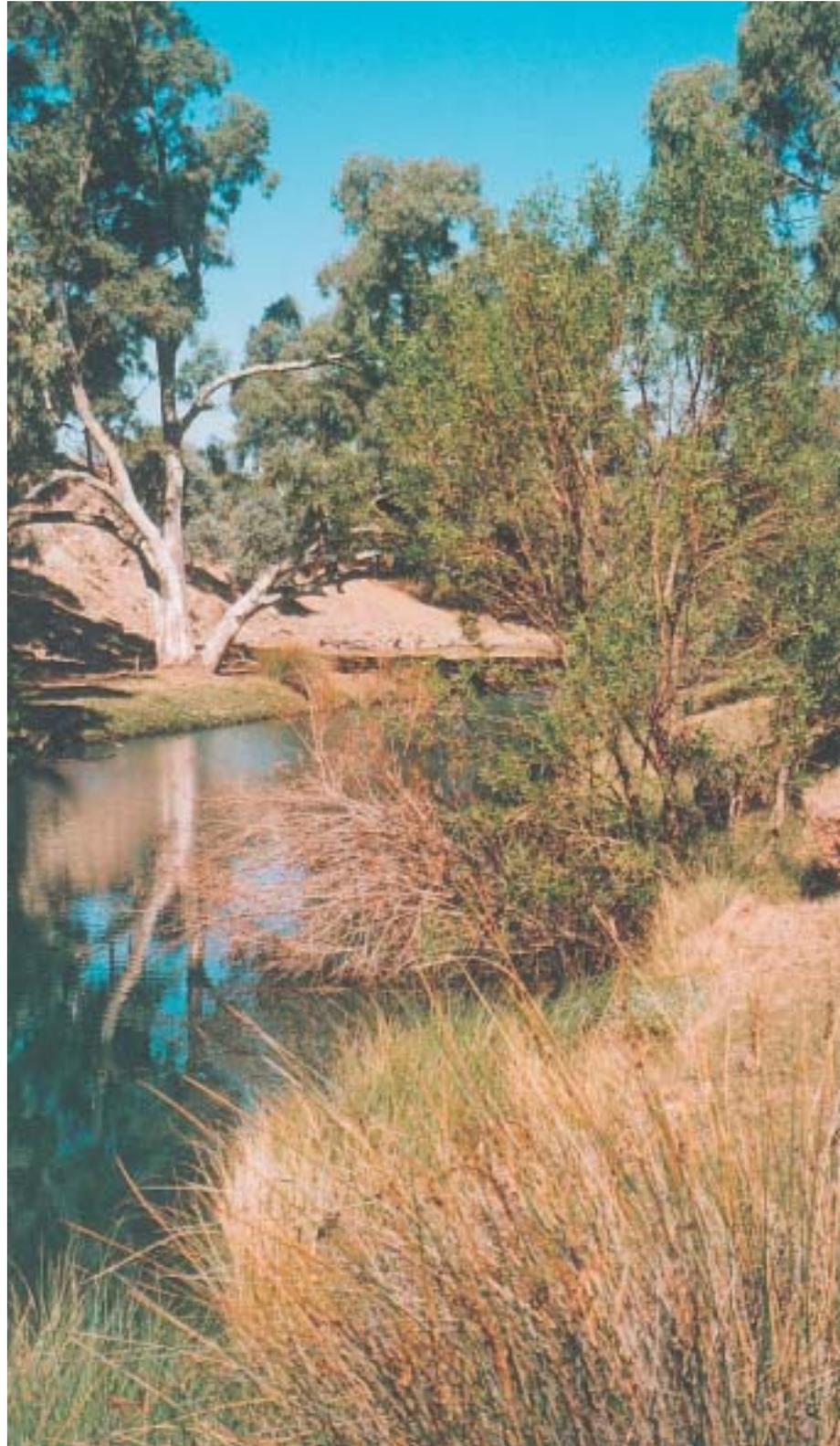
Riparian environments are subject to natural disturbances such as flooding or fire, as well as the impacts of stock grazing and machinery access. Most weed species are more likely to invade riparian vegetation that has been disturbed.

Most weed species find it difficult to invade and establish into intact riparian vegetation. Weeds will usually find it harder to compete and establish if vigorous pasture and healthy riparian vegetation is maintained or established. Managing grazing so that ground cover is maintained is the key management practice for woolgrowers to follow to prevent weeds becoming a problem on their property.

It is vital to promote natural regeneration or to revegetate as soon as possible after a disturbance, otherwise weed invasion is more likely to occur. This is especially true for riparian land that has become degraded through natural or man made disturbance.

Riparian means any land which adjoins, directly influences or is influenced by a creek or river.

Even with a thorough approach to pasture management, some weed species, especially suited to riparian areas may become established. Some recommended management approaches to reduce the risk of weed invasion include:



Weeds will usually find it harder to compete and establish if healthy riparian vegetation is maintained.

Photo Kylie Nicholls.

1. Maintain a mix of different native vegetation types and ground cover, preferably a mix of trees, shrub understorey and grass. This will make it harder for many weeds to find niches to invade.
2. Maintain native riparian vegetation so that it is wide enough to resist drying winds, nutrient movement and the transport of weed seeds in bird droppings, as these factors assist in weed invasion. The ideal width is at least 25–50 metres.
3. Avoid excessive human disturbance in riparian areas, such as repeated vehicle and equipment access. Occasional access may be required for spraying, ripping of rabbit warrens or laying baits.
4. Exclude stock from riparian lands or use fencing to control the timing and length of grazing. Carefully-managed grazing by stock can be used to help control palatable weeds; grazing alone rarely kills weeds, but can reduce their size to allow other control methods to be more effective.
5. Where weeds have already invaded riparian vegetation, control them by a combination of chemical, mechanical and cultural methods. Specific control options are included in this fact sheet for three key weeds identified in the Burra area.
6. When controlling weeds using herbicides, only those registered for use in riparian lands and near water courses should be used.
7. Work with neighbours to prevent re-infestation of riparian areas after treatment. Many weed invasions of relatively intact riparian vegetation have come from adjacent and upstream lands. Where possible start control programs upstream.
8. Where large tracts of weeds have been controlled/removed, sowing the areas with pasture or native species may prevent re-invasion, as well as stabilising any exposed soil.
9. Develop a property biosecurity plan. Ensure vehicles, machinery and fodder are free of weed seeds before allowing on the property. It is good practice to place purchased livestock in a small holding paddock for up to 30 days to ensure no viable weed seeds remain within or on them. This area can then be easily monitored for any follow-up control required.

Key weeds in the Burra region

As part of the Land, Water & Wool – Rivers Project near Burra, weed management of on-property riparian areas has focused on three weeds identified by local woolgrowers as being a high priority for control.



Left: The Wild artichoke thistle (*Cynara cardunculus*) is very invasive and can quickly spread along creeks. Above: The Wild artichoke thistle forms a rosette of very large, deeply lobed leaves that can be up to 30 cm wide. Both photos Heidi Nicholson.

Wild artichoke thistle (*Cynara cardunculus*)

Biology

- Perennial plant to 2 m in height; forms a rosette of very large deeply lobed leaves up to 1 m long and 30 cm wide. Upper surface of the leaves is greyish-green, lower surface appears almost white because of a dense mat of white hairs.
- Reproduces from seed and annual regrowth from a large fleshy taproot to 2 m long. Seeds germinate mainly in autumn; plants develop slowly over winter with rapid growth in spring, usually flowering in its second summer.
- Stems produced in spring bear flower heads 7–13 cm across at the end of each branch in summer. Usually one stem per plant (but can be up to eight stems).

- Seeds 6–8 mm long, brown or black and streaked lengthwise, topped by a loosely attached pappus of feathery hairs to 4 cm long.
- Most dispersal is via seed, generally dropping within metres of the plant. Weight of the seed reduces dispersal by wind to an area of less than 20 metres. Seed is also spread by animals, birds and floodwaters. Pieces of cut root can also generate new plants. Artichokes establish best on bare or disturbed ground.

Impacts

- Invasive and able to dominate the vegetation of an area once established.
- Large plants smother most pasture growth and draw significant moisture and nutrients from the soil. It can also compete with crops and impede harvesting operations.
- The prickly nature of the leaves deters sheep and cattle from areas of heavy infestation.



Left: The Pepper tree (*Schinus molle*) has drooping fern-like leaves and can grow into a large spreading tree up to 12 metres in height. Photo Heidi Nicholson. **Right:** Pepper tree fruit is small, pink and red and generally matures over summer. Photo Leah Feuerherdt.

Pepper trees (*Schinus molle*)

- Native to northern South America and to Mexico.
- Large spreading tree to 12 m in height.
- Drooping fern-like leaves divided into 3–17 leaflets, which are 3–4 cm long and sticky and aromatic when crushed.
- Flowers are small, white with five petals and hanging in pendulous sprays. Flowering occurs over spring–summer with male and female flowers often borne on separate plants.
- Fruit is small (4–7 mm diameter), pink to red, shiny and fleshy with a seed inside. Most fruits mature over spring–summer but they may flower and seed at any time of the year.
- Bark is fissured or flaky and a light to dark brown in colour.
- Reproduction is by seed, which is dispersed by birds and possibly foxes and possums.

Impacts

- Invasive along seasonal watercourses and open woodlands, they are associated with disturbed and degraded environments.
- Compete strongly with other plants for water and nutrients and are very tolerant of hot, dry conditions and exposed locations.
- Spread is slow but when left unchecked extensive localised stands can build up.
- Vehicle access (including ATVs) for mustering and grazing can be prohibited by tree density. Traversing on foot can also be difficult in dense areas of an infestation.
- Ecosystem functions, such as movement of floodwaters, no longer occur as the path of the watercourse has been altered by the trees.
- Soil around Pepper trees is often bare as they shade and crowd out native vegetation, the bare soils can accelerate erosion problems especially on slopes and near watercourses.



Left: African boxthorn (*Lycium ferocissimum*) is extremely tough and has an extensive, deep root system.

Right: African boxthorn fruit and leaves. Both photos Heidi Nicholson.

African boxthorn (*Lycium ferocissimum*)

Biology

- An erect shrub to 5 m high and 3 m across that reproduces by seed.
- Leaves are glabrous (without hairs or bristles) to 3.5 cm long and 2 cm wide, flowers are about 1 cm diameter, white with lilac or purple markings in the throat.
- Boxthorns fruit is orange/red and about 1 cm in diameter. Each fruit contains 20–70 seeds.
- Extensive, deep and branched root systems that produce sucker shoots if broken.
- Seeds germinate at any time of the year and young plants are competitive with other species. Plants do not flower until at least 2 years old and flowering and fruiting occurs mainly in summer.
- Seeds are the primary method of dispersal although vegetative reproduction may occur where dislodged root pieces and stem fragments come in contact with moist soil. Birds and foxes commonly eat the fruit and the seeds are viable when excreted. The occurrence of African boxthorn under trees, poles and fences where birds have perched is evidence of their importance in dispersal.
- Extremely tough species adapted to a wide range of conditions, and favours disturbed areas.
- African boxthorn may be confused with the native Australian boxthorn (*Lycium australe*). The native boxthorn occurs in semi arid regions and is rarely more than 1.5 m high. Its leaves are smaller and thicker than African boxthorn and each fruit contains only 5–20 seeds.



African boxthorn flower. Photo Heidi Nicholson.

- African boxthorn provides excellent cover for rabbits which frequently burrow under the tree and the fruit is a breeding place for many insects including fruit fly and the common house fly.
- Shades and crowds out other vegetation preventing any regeneration.

Impacts

- African boxthorn grows to a great size when left unchecked, which can hinder stock access to water points and impede stock movement as well as replacing large areas of pasture.

Management options

Please note that where the costs per hectare have been presented, this information is based on specific trials at a particular location, thus these costs present a guide only as many variables (e.g. terrain, level of infestation, climate) can affect the total cost involved at different locations.

Wild artichoke thistle

Best practice control options	Plant growth stage	Timing and conditions	Costs per hectare	Follow up recommendations
Herbicide application <i>Foliar application</i> Roundup Bioactive Spotspray at 500 ml:100 L water Boom spray 3 L/ha	Rosette — early head stage.	Apply in spring before flowering stalk emerges. For large infestations use a marker dye to ensure all individuals are treated.		Larger plants and infestations may require follow up treatment to control seedlings/regrowth.
Tordon 75D Spot spray at 125 ml: 100 L water Boom spray 2.5 L/ha <i>Always use chemicals in accordance with the label. Advice, taking your situation into consideration, should be sought from a local chemical reseller.</i>	Rosette — early head stage.	If spraying when flowering double recommended rate. The chemical can remain active in the soil so may not be appropriate for some unstable areas or those subject to flash flooding. Tordon is also hormone based so use with caution near susceptible vegetation.		



Pepper trees

Where budget limitations apply, focus initial control on removing female plants.

Best practice control options	Plant growth stage	Timing and conditions	Costs per hectare	Follow up recommendations
<p>Herbicide application <i>Basal bark method only</i> Access at 1:60 with diesel</p> <p><i>Always use chemicals in accordance with the label. Advice, taking your situation into consideration, should be sought from a local chemical reseller.</i></p>	Plants with stems up to 10 cm basal diameter including saplings and multi-stemmed trees.	<p>Do not treat if stems are wet or charred</p> <p>Thoroughly treat whole circumference of stem to 30 cm high.</p> <p>Apply when trees are actively growing (i.e. not dormant) and there is good foliage cover.</p>		As plants can reshoot, follow up treatments may be required. Treated plants should be periodically checked. It may take a few years to completely kill the plant.
<p>Physical removal <i>Hand removal</i></p>	Seedlings and small plants only.	Tops are likely to break away so if roots remain ensure they are dug out.	Labour only	Areas where Pepper trees have been removed must be checked carefully for several years to detect and treat seedlings and regrowth. Revegetation of treated areas may prevent unwanted regrowth of Pepper trees or secondary weeds that may colonise the disturbed areas.
<i>Excavator</i>	Large plants and dense infestations.	Causes minimal soil disturbance compared to other mechanical measures i.e. bulldozers.	\$110/hour	

African boxthorn

The costs included in the following table are based on trials carried out in 2004 at Sturtvale Station, 125 kilometres north of Burra, South Australia, by Rural Solutions SA and should be used as a guide only.

Costs may have increased since then and other factors specific to each individual situation may alter the cost involved for each method.

Physical removal is effective as plants are totally removed, reducing pest harbours (i.e. rabbits) and increasing pasture space.

Herbicide application and leaving remaining dead plants intact may be appropriate in areas of erodible soil where mechanical removal is not feasible, such as a creek bank.

Best practice control options	Plant growth stage	Timing and conditions	Costs per hectare	Follow up recommendations
<p>Herbicide application <i>Basal bark and cut stump</i> Access at 1:60 with diesel Or Garlon 600 at 1:30 with diesel</p> <p><i>Always use chemicals in accordance with the label. Advice, taking your situation into consideration, should be sought from a local chemical reseller.</i></p>	<p>Basal bark saplings and regrowth <5 cm basal diameter. Cut stump >5 cm diameter.</p>	<p>Do not treat if stems are wet or charred. Thoroughly treat whole circumference of stem to 30 cm high Apply when there is good foliage cover.</p>	<p>\$0.40–0.80 per tree depending on herbicide</p>	<p>After herbicide application, plants lose their leaves quickly and appear close to death. However, new leaves are frequently produced and treated individuals should be periodically checked for regrowth and treated where appropriate. It may take a few years to completely kill the plant.</p>
<p><i>Foliar spray</i> Grazon DS at 500 ml/100L water</p>	<p>Juvenile or smaller individuals.</p>	<p>Apply when plant is actively growing (late winter/spring). Entire leaf area must be treated to point of run-off.</p>		
<p>Physical removal <i>Hand pull or dig out</i></p>	<p>Seedlings and small plants only.</p>	<p>Tops are likely to break away so ensure roots are dug out.</p>	<p>Labour only</p>	<p>Areas where Boxthorns have been removed must be checked carefully for several years to detect and treat seedlings and regrowth. Revegetation of treated areas may prevent unwanted regrowth of Boxthorns or secondary weeds that may colonise the disturbed areas.</p>
<p><i>Blade plough and D6 bulldozer</i></p>	<p>Heavier infestations.</p>	<p>Treated area will need to be raked to clean up left behind pieces.</p>	<p>\$100/hour \$430/ha</p>	<p>As above.</p>
<p><i>Boxthorn plucker</i></p>	<p>Individual adult plants <2 m high.</p>	<p>Cannot treat very large individuals.</p>	<p>\$135/hour up to \$2000/ha</p>	<p>As above.</p>
<p><i>D4 bulldozer</i></p>	<p>Can treat any level of infestation but more cost effective in high density areas.</p>	<p>Can cause large soil disturbance.</p>	<p>\$50/hour</p>	<p>As above.</p>



Gill Strachan case study

Reducing a significant Pepper tree weed infestation in the floodplain areas of their pastoral property near Burra is a major priority for owners Gill and Ruth Strachan.

The Strachan family run a self-replacing flock of 3000 Merino ewes, averaging about 21 micron, on their 12,493 hectare property, The Gums, along with 100 head of cattle.

The average annual rainfall is 250 mm however they have not received this average for the past eight years.

Part of The Gums is a floodplain zone for the Burra Creek and heavy summer rains in 1992 caused a major flow of water dispersing Pepper tree seed across an area of about 289 hectares in a 650 hectare paddock known as The Swamp.

The Pepper tree infestation has had some significant problems for the Strachan family as it is highly invasive and competes strongly with native plants for water and nutrients. According to Gill it has significantly reduced the area of productive pasture in this paddock and also created a habitat for the spread of other weeds such as Bathurst Burr and the Castor Oil bush.



In some areas it has grown to a large spreading tree up to 12 metres in height and established in dense stands which Gill said made it very difficult to access the areas for mustering and grazing, particularly by sheep. During the past few years, only cattle have been run in this area.

Early on, The Gums received funding from the Rangelands Action Program and Rural Solutions SA to carry out management trials on the Pepper tree infestation.

A combination of treatments was used including mechanical methods such as bulldozer, blade plough and excavator to physically push out the Pepper trees.

South Australian woolgrower Gill Strachan, The Gums, Burra, has had a long battle with a Pepper tree infestation in his floodplain country.

Photos this page Kylie Nicholls.

Castor Oil bush.





Gill has trialed a range of different weed management methods on The Gums, Burra, including the mechanical removal of the Pepper trees using a bulldozer. He believes the bulldozer leaves the land very disturbed which has reduced the rate of regeneration and left areas of bare ground which could potentially create further weed and erosion problems. Photo Kylie Nicholls.

Herbicide treatments were also carried out, when the trees are actively growing, using the basal bark method which involves making small cuts in the tree stem and placing herbicide in these cuts. According to Gill this method is most effective on younger plants.

These treatment methods have reduced the Pepper tree infestation to less than 155 hectares. However continuing dry conditions in the past eight years have restricted any further control of the Pepper trees.

From Gill's long term experience on the property and previous weed treatments, he believes the excavator is the best practice method, particularly on larger trees as the areas which were excavated have recovered quickly and there has been significant regeneration of the native shrub and perennial grass species.

The areas treated with a bulldozer or blade plough were left very disturbed which had reduced the rate of regeneration and left areas of bare ground which could potentially create further weed and erosion problems.

Gill would like to continue excavation of the dense areas of Pepper trees however the expense of the method, which costs about \$110 per hour, limits its use.

Gill said follow up treatment of young Pepper trees using herbicide applications is also vital as plants can re-shoot and it may take several years to completely kill the plant. Sheep could also be used as a control as Gill and Ruth have observed that they will graze young Pepper trees under about 1 metre in height.





Gill believes trial work at The Gums, Burra, using an excavator has shown it to be the best practice method, particularly on larger trees as the land has recovered quickly and there has been significant regeneration of native shrub and perennial grass species. Photo Kylie Nicholls.

As part of the Land, Water & Wool project, funding was provided to subdivide the Pepper tree infested paddock into smaller paddocks which will allow sheep to graze some of the areas with a light scattering of Pepper trees.

Best practice herbicide treatment has now been undertaken at The Gums (February 2007). Plants were treated using the basal bark method with Access and Diesel (refer to the table on page 8 for rates and method details). All treated plants appear to have been killed but monitoring will be required to control any plants that may resprout.

Although the floodplain country is only a small part of Gill and Ruth's property, they believe they have a significant responsibility to try and eradicate the Pepper trees, both for the long-term health of the Burra Creek and properties which are located downstream.

Resources

There are a number of organisations that produce useful information for woolgrowers. For creek and riparian management, including detailed information on revegetation of riparian areas, weed control and managing stock along creeks the most comprehensive range of fact sheets, technical guidelines and manuals can be accessed at www.rivers.gov.au.

Other useful contacts at the national, state and local level are listed below.

Land, Water & Wool SA Rivers Project

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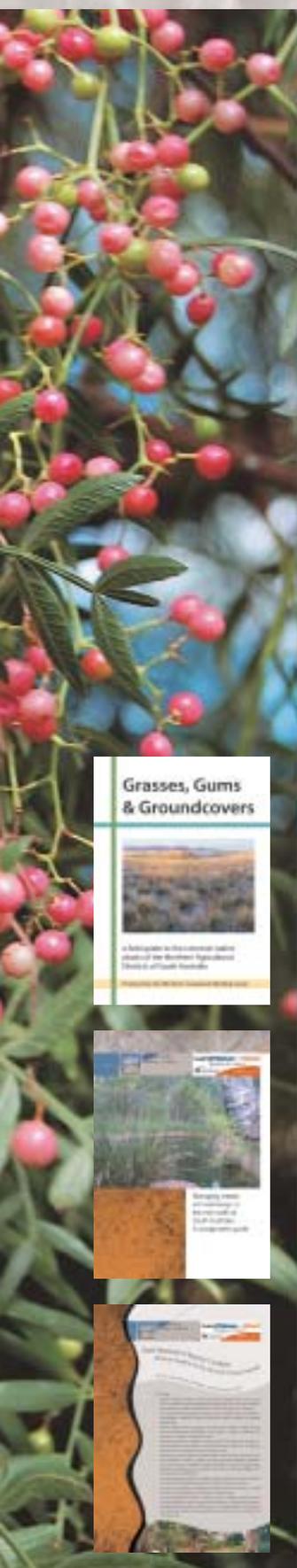
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Mid North Grasslands Working Group

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Web: www.nativegrass.org.au

Northern & Yorke Natural Resources Management Board

Tel: 08 8636 2361
E-mail: nynrm@bigpond.com
Web: www.nynrm.sa.gov.au

Department of Water, Land and Biodiversity Conservation (DWLBC)

Tel: 08 8463 6800
Web: www.dwlbc.sa.gov.au

Department for Environment, Heritage and Aboriginal Affairs

Tel: 08 8204 9000
Web: www.dehaa.sa.gov.au

Weeds Australia

Tel: 03 6344 9657
Web: www.weeds.org.au

CRC for Australian Weed Management

Tel: 08 8303 6590
E-mail: crcweeds@adelaide.edu.au
Web: www.weeds.crc.org.au

Useful publications

Native Vegetation of the Murray Region, February 2006, Todd Berkinshaw, Greening Australia (SA) Inc., ISBN 0 9775143 0 7. A guide to the identification, protection and restoration of native vegetation communities and plant species of the South Australian Murray Darling Basin.

Noxious Weeds of Australia, 2001, Parson, W. & Cuthbertson, E., CSIRO Publishing, ISBN 0 643 06514 8. A comprehensive book on the biology, control and legislation pertinent to many of Australia's weed species.

Bush Invaders of South-East Australia, 2001, Muyt, A.R.G. & Richardson, F.J., Victoria. ISBN 0 9587439 7 5. Presents a detailed account of over 150 environmental weeds and the range of control techniques available.

Noxious and environmental weed control handbook 2004–2005, Ensbey, R., NSW Agriculture, Orange. ISSN 1443 0622. A guide to weed control in non-crop, aquatic and bushland situations.

Grasses, Gums & Groundcovers, a field guide to the common native plants of the Northern Agricultural Districts of South Australia, Mid North Grasslands Working Group, Custom Press. Information: Kylie Nicholls, PO Box 488, Clare SA 5453, Tel: 08 8842 3275, E-mail: fullbottlemedia@rbe.net.au

'Preventing creek erosion', *Land, Water & Wool fact sheet*, 2007, Land & Water Australia.

'Planned grazing management', *Land, Water & Wool fact sheet*, 2007, Land & Water Australia.

Managing creeks and waterways in the mid north of South Australia: A woolgrowers guide, 2007, Land & Water Australia.

Rapid Appraisal of Riparian Condition, Technical guideline for the mid north of South Australia, Jansen, A., Robertson, A., Thompson, L., Wilson, A. & Nicholls, K. 2006, Land & Water Australia, Canberra.



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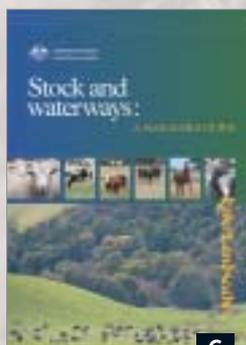
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Publications for woolgrowers

The *Wool industry river management guides* bring together the latest science and recommended management practices for riparian areas within the context of a commercial wool-growing property. The Guides are available for the high rainfall regions (above 600 mm) and sheep/wheat regions (300–600 mm) of Australia. Each book has over 200 full-colour pages.

In addition www.rivers.gov.au/lww will offer an active contents list which will give you a snapshot of what is in each section.

1. High rainfall zone: product code PX050951
2. Sheep/wheat zone: product code PX050952

Managing rivers, streams and creeks: A woolgrowers guide — is a summary of the key recommendations from the 'Wool industry river management guides' and provides an introduction to river and riparian management issues on farm.

3. Product code PX051003

Are my waterways in good condition? — a checklist that provides colour coded pictures that you can use to assess the condition of your stream or creek. It is a quick and easy way to work out the health of the streams or creeks running through your property, and it suggests management actions to improve or maintain these vital parts of your farm.

4. Product code PB061114

River Insights — a publication featuring the stories of ten woolgrowers and what has motivated them to manage their rivers, creeks and streams in ways that make both economic and environmental sense.

5. Product code PK050950

Stock and waterways: a manager's guide — offers practical advice on how stock farmers can manage riparian land both productively and sustainably, and includes a number of case studies from farmers throughout Australia who have seen the benefits of changing their management practices.

6. Product code PR061132

These products are available from CanPrint Communications on freecall 1800 776 616 in hard copy, or can be downloaded from — www.landwaterwool.gov.au or www.rivers.gov.au

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