Weed management on watercourses

This introductory guide has been prepared to help individual landholders and the community develop a plan for sustainable weed control activities in riparian lands. Riparian land can be defined in a number of ways, but put simply it is "any land which adjoins, directly influences, or is influenced by a body of water" (Land & Water Australia, 2007). This guide describes the biology and impact of the main weeds they are likely to encounter as well as the steps to develop a weed management plan.

Riparian land and weed management

The Northern & Yorke Region contains four priority catchments: Willochra, Broughton, Wakefield and Light. These catchments cover an area of 1,460,000 hectares and contain native riparian vegetation corridors within a largely cleared landscape of primarily introduced species.

The catchments lie adjacent to each other in a north-south direction and include diverse riparian vegetation communities. Key watercourse vegetation types recorded across the catchments include: riverine forest/woodlands; riverine shrubland; chenopod shrubland; mangrove forest and samphire marsh; lignum swamp; sedgelands; reedbeds; and submerged aquatic vegetation.

These catchment areas support two nationally threatened ecological communities: peppermint box grassy woodland and iron-grass natural temperate grassland. There are currently also 25 nationally threatened plant species including ten orchid species (*Caladenia gladiolata*, *Prasophyllum pallidum*, *P. validum*, *C. tensa*, *C. macroclavia*, *C. woolcockiorum*, *C. xantholeuca*, *Pterostylis despectans*, *Pterostylus sp Halbury and C. argocalla*); three wattle species (*Acacia carneorum*, *A. glandulicarpa* and *A. spilleriana*); slender bell-fruit (*Codonocarpus pyramidalis*); silver daisy-bush (*Olearia pannosa sp pannosa*); superb groundsel (*Senecio megaglossus*); spiny everlasting (*Acanthocladium dockeri*); large-fruit fireweed (*Senecio macrocarpus*); clover glycine (*Glycine latrobeana*); yellow Swainson-pea (*Swainsona pyrophila*); bead glasswort (*Tecticornia flabelliformis*); trailing hop-bush (*Dodonaea procumbens*); peep hill hop-bush (*Dodonaea subglandulifera)*; Spalding blown grass (*Lachnagrostis limitanea*); and Osborn's eyebright (*Euphrasia collina ssp osbornii*).

Weeds have become a serious threat to the ecological integrity and productivity of South Australian vegetation communities because of primary disturbances, such as vegetation clearance, fire and unsustainable stock grazing.

Habitat loss and degradation in riparian areas has also been caused by:

- past native vegetation clearance
- inappropriate grazing and browsing pressure from livestock
- inappropriate burns
- introduced pests
- chemical use and pollution
- revegetation with inappropriate species or seed sources
- altered flooding regimes.

Weeds now dominate riparian areas throughout South Australia, including the Weeds of National Significance (WoNS): African boxthorn, bridal creeper, blackberry, boneseed and gorse. These are highly-invasive, high-impact weeds that are difficult to manage without a coordinated weed management program. To manage these weeds and declared weeds in the area, it is important to address the areas of degradation which encourage their establishment and implement a systematic control program with follow-up monitoring.

If weeds are neglected and become dominant, then the productivity and diversity of native riparian vegetation can seriously decline and the total cost of weed control is high. Prevention of weed infestations is far more cost effective than control. Most properties in the Northern & Yorke Region have agricultural or environmental weeds that need to be controlled to some degree. The majority of these weeds were deliberately introduced from overseas, either as garden species or plants for agriculture.

Why should we manage weeds within the catchment?

Riparian land is an important part of Australian ecosystems because it is often the most diverse and productive part of the landscape. Riparian land contains a wide range of habitats and food types; is close to water; has a less extreme microclimate; and can provide refuge. There are many native plants found primarily or only within riparian areas. These areas are essential to many native fauna during their lifecycle, particularly in times of stress, such as drought or fire.

In-stream vegetation also plays a vital role in regulating healthy ecosystems for invertebrates within riparian areas. It provides shade that reduces light levels and water

temperature and supplies energy and nutrients important to aquatic organisms as well as essential aquatic habitat.

Riparian areas provide a range of benefits in Australian ecosystems and this has been clearly recognised and valued in recent years.

Riparian ecosystems can:

- improve water quality by trapping sediment, nutrients and other contaminants before they reach a waterway
- lower water tables
- reduce bank erosion and loss of valuable lands
- control nuisance aquatic plants through shading
- provide a source of food and habitat for watercourse animals
- ensure healthy watercourse ecosystems
- support sustained agricultural productivity
- provide cultural and spiritual enrichment for people.

Today, weed invasion in riparian areas is a serious threat to local landowners and ecological communities. Riparian land that has become degraded by past land use, affected by flood or wildfire is at increased risk of weed invasion. Weed introduction can often be instigated through wind dispersal of seeds, seed deposition in the droppings of birds and animals, or the transport of seeds or vegetative material from upstream water.

Weeds of National Significance

Bridal creeper (*Asparagus asparagoides*)

Biology

- South African vine that smothers native plants in many areas of South Australia. It is a climbing perennial herb.
- Grows to three metres with glossy oval leaves or blue-green needle-like leaves. It tolerates heavy shade and many soil types.
- Stems grow quickly from June and flowering begins in August. Growth ceases in very hot, dry periods, with plants becoming dormant. New growth begins again in February.
- Flowers are white and star-shaped, forming round, red, sticky berries 6–10 mm in diameter.
- Ripe fruit, on which birds feed and distribute the seed, can stay on the plant for many months.

Impact

- Threatens native vegetation by strongly competing for space, light, water and nutrients.
- Difficult to control chemically due to the risk of damage to the native species they grow amongst.
- Can cause shading of other vegetation.
- Interferes with stock access to water and feed.

Blackberry (*Rubus fruticosus*)

Biology

- Reproduces by seed, root and tip rooting, with germination in spring.
- Growth is slow at first and young plants remain small.
- Canes are biennial, emerging from the crown in winter and developing tip roots in autumn. Flowering shoots appearing along the canes the following summer.
- Plants may be deciduous and lose their leaves in winter.
- Spread mainly by birds and animals feeding on the fruit and dropping the seed at a distance. Seeds may also be transported along watercourses.

Impacts

- Major weed of native vegetation in South Australia, introduced from Europe.
- Established plants are difficult to control. It is important to control new occurrences and to destroy existing plants early.
- Highly invasive to other vegetation.
- Excludes light from the soil surface with its dense canopy.
- Increases fire hazard and may harbour pest animals.

Boneseed (*Chrysanthemoides monilifera*)

Biology

- Reproduces by seed. These can germinate year-round but mainly germinate in autumn.
- Flowers are formed in late winter and spring with seeds shed in summer. A hard seed coat enables them to remain dormant for years, with some germinating each year.
- Fire will stimulate the entire seed bank to germinate at once.
- Birds spread the majority of seeds, but animals will also eat the fruit and transport seeds.
- Contaminated soil or water disposal may contribute to seed spread.

Impacts

- Establishes in a wide range of native vegetation types including shrubs, woodland and forest. It can out-compete and eliminate many native species.
- Establishes most rapidly on disturbed sites such as cleared, cultivated or burnt areas.
- Rapid growth, large seedbank and ability to regenerate after fire are characteristics that make it invasive.
- Greater effective leaf area and a more vigorous root system than many native species. This gives it a competitive advantage.
- May produce chemicals that prevent some plants from growing nearby (allelopathic properties).

Gorse (*Ulex europaeus*)

Biology

- A spiny 3–4 m tall shrub introduced from Europe as a hedge plant.
- Young growth is green and older shoots become brown.
- Leaves are dark green, hairy, narrow, spine-like and 1–3 cm long.
- Flowers are bright yellow, pea-shaped and about 2 cm long.
- Fruits are a 1–2 cm long dark pod, covered in dense hair and containing 2–6 seeds.
- Not restricted to any particular soil type, but most competitive on poor, alkaline soils.

Impacts

- Major problem in native vegetation and forestry where plants compete strongly with young trees and thickets.
- Increases fire hazard along plantation edges.
- Deep root system enables proliferation in areas with very low rainfall.
- Seeds can remain dormant but viable for 75 years or longer, building up a huge seed bank in the soil.

Declared weeds

African boxthorn (*Lycium ferocissimum*)

Biology

- Extremely tough species adapted to a wide range of conditions.
- Grows to 5 m high and 3 m across and reproduces by seed.
- Leaves are glabrous to 3.5 cm long and 2 cm wide, flowers are about 1 cm in diameter, white with lilac or purple markings.
- Fruits are orange/red in colour, about 1 cm in diameter and contain 20–70 seeds.
- Very competitive and seeds may germinate year-round. Plants do not flower until plant is at least two years old. Flowers and fruit are produced mainly in summer.
- Seeds are the primary method of dispersal but vegetative reproduction may occur where root pieces come in contact with moist soil. Birds and foxes are common dispersal agents as they consume the fruit.
- May be confused with the native Australian boxthorn which occurs in semi-arid regions. This plant is rarely more then 1.5 m high with smaller, thicker leaves and fruit only containing 5–20 seeds.

Impacts

- Capable of replacing large areas of pasture due to large plant size.
- Provides excellent cover for rabbits which frequently burrow underneath. The fruit is a breeding place for many insects, including fruit and house flies.
- Shades and crowds out other vegetation, preventing regeneration.

Wild Artichoke (*Cynara cardunculus*)

Biology

- Perennial plant to 2 m in height with 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 due to a dense mat of hairs.
- Reproduces from seed. Annual regrowth from a large taproot up to 2 m long.
- Flower heads measure 7–13 cm across and occur at branch ends. Plants usually produce one stem per plant but may produce up to eight.
- Seeds are 6–8 mm long and brown or black.
- Dispersal occurs mostly via seed, generally within metres of the parent plant. Wind dispersal is possible up to 20 m. Animals, birds and floodwaters can also disperse seed although new plants can also be generated from pieces of cut root.

Impacts

- Deters livestock from areas of heavy infestation by its prickly nature.
- Extremely invasive and usually dominates the vegetation once established.
- Competes with crops and impedes harvesting operations.
- Draws significant moisture and nutrients from the soil.

Horehound (*Marrubium vulgare*)

Biology

- Native to southern and western Europe; western and central Asia; and North Africa.
- Perennial spreading herb to 80 cm high.
- Leaves to 7 cm long; margins with rounded teeth; hairy; stems long and star-shaped.
- Fruit is a burr with backward facing hooks, seeds about 2 mm long, with a roughened surface.
- Deeply rooted, with a woody taproot and fibrous lateral roots.

Impacts

- Out-competes and replaces native plants in riparian areas.
- Hardy, widespread weed of disturbed areas. Common around sheep camps and stock yards.
- Unpalatable to stock and quickly spreads due to its free seeding habit.
- Dispersed mostly by fruit with hooks that attach to wool, fur, bags and other material. Spread also occurs via waterways.

Dog rose (*Rosa canina*)

Biology

- Native to Europe and Middle East.
- Scrambling or sometimes climbing, prickly shrub that forms dense thickets and grows 1–5 m.
- Smooth, hairless stems are armed with scattered prickles up to 10 mm long.
- 5-7 leaflets (each 1.5–4 cm long and 1–2 cm wide) with sharply toothed margins.
- Smooth, hairless fruit (1–2 cm long) is oval or rounded and turns orange or scarlet red as it matures.

Impacts

- Listed as a priority declared weed in South Australia.
- Climbing, prickly shrub that forms dense thickets.
- Usually grows 1–3 m tall, but sometimes reaches 5 m in height when climbing over other vegetation.
- Seeds are mainly dispersed by birds and animals.
- Reproduces mostly by seed, but may also produce new shoots from its long-lived rootstock.

Wild olive (*Olea europaea*)

Biology

- Introduced from the Mediterranean as a tree crop.
- Grows on a wide range of soil types but will not survive in waterlogged soil.
- Bushy, evergreen tree growing to about 12 m tall with a deep, widely-branched, woody root system.
- Tiny cream flowers appear in October/November (late spring) in large clusters.
- Fruit reaches 1.5–3 cm long, is ellipsoid in shape and purple-black when fully ripe.
- Mainly spread by birds and foxes eating the fruit and transporting the seeds.

Impacts

- Invades native vegetation, especially in dry forest and woodland.
- Highly flammable due to oil content. Can regenerate from stumps after fire.
- Alters the vegetation composition and decreases biodiversity.
- Very long life expectancy unless controlled.

Scotch Broom (*Cytisus scoparius*)

Cape broom (*Genista monspessulana*)

Biology

- Shrub introduced from Europe as a hedge plant.
- Plant may live for up to 20 years and grow to 3 m high.
- Stems are woody, densely branched and dark green in colour with ridges along their length.
- Leaves are small, occurring singularly or in clusters at nodes along the stem. Each leaf has three oval leaflets.
- Flowers are pea-shaped, about 2 cm (Scotch broom) and 1.2 cm (Cape broom) long and bright yellow in colour.
- Flowers in late winter and spring; sometimes in late summer and autumn.
- Fruit is a flat, hairy on the edges, brown or black pod. These can grow to 5 cm long and 1 cm wide and contain 6–22 seeds (Scotch broom) and 5–8 seeds (Cape broom).
- Scotch broom seeds are yellowish-brown, shiny, rounded, flat, 3–4 mm long and 2 mm wide. They can remain in the soil for 10 years.
- Cape broom seeds are dark brown to black, rounded, flattened, smooth, and shiny and approximately 2 mm in diameter.

The common distinguishing features between these two species relate to flower size and seed pods. Scotch broom has larger flowers 1.5–2.5 cm long and pods are only hairy along margins. Cape broom has smaller flowers and mature pods are densely hairy.

Impacts

- Invades native vegetation and forms long-lasting seed banks.
- Dominates other shrub vegetation, smothering even large plants and preventing new plants from establishing.
- Thickets will harbour pests and increase the fire hazard.
- Seeds accumulated in the soil germinate in large numbers after a fire.

Weed management

Prevention

Prevention is the first and most important part of weed management and represents good land management. This is true for both environmental and agricultural weeds as prevention is more cost effective than treatment.

To reduce the risk of weed invasion, landholders can:

- sustain a mix of different native vegetation and ground cover, preferably a mix of trees, shrubs and groundcover
- maintain wide and healthy native riparian vegetation colonies to resist drying winds, nutrient movement and the transport of weed seeds in bird droppings. The ideal width is least 25–50 m
- eliminate stock from riparian land or use fencing to control the timing and length of grazing. Carefully managed grazing can be used to help control palatable weeds
- avoid excessive human disturbance in riparian areas, such as constant vehicle access
- cooperate with your neighbours to prevent infestation. Many weed invasions of relatively intact riparian vegetation have come from adjacent and upstream land
- ensure vehicles, machinery and fodder is free of weed seeds before allowing on property.

Developing a weed management plan

It is important to develop a weed management plan for each particular site impacted by weeds. The most effective control is achieved when a variety of methods are used to target susceptible aspects of a weed i.e. lifecycle or environment.

There are four main steps to developing a weed management plan.

Step 1 Assessing the site

Land managers should be familiar with the vegetation of their local area so they can react to new weed infestations before they become difficult or costly to control.

- Monitor the occurrence of weeds on the property by recording their location as well as general fire history and disturbance history.
- Determine weed density on the site. This will help to prioritise weed control efforts and assess how well they have worked.
- Create a map of weeds observed.
- Identify weed-free areas and keep them free of weeds.
- Learn about the lifecycle of the weeds on the property.

Step 2 Setting objectives

- Determine which weeds are the highest management priority, taking into account the impact level of each weed on site and the viability of their control.
- Set realistic timeframes for control: short term – 1 to 2 years; medium to longer term – 5 to 10 years.

Step 3 Selecting weed control options

In many cases the most cost effective and sustainable way to control weeds is to combine or integrate a number of different control methods. There are four main treatment options: chemical, mechanical, biological and hand weeding.

Chemical

When weeds are spreading, herbicides are often the first management tool considered to provide a quick solution to the problem. Best practice chemical control works to selectively control the undesirable plants (weeds) but leave desirable plants relatively unharmed. There is a very high risk of off-target damage from herbicides within riparian areas as many herbicides are toxic to aquatic ecosystems. Additional care needs to be taken in riparian areas in addition to standard best practice chemical application methods, such as following the guidelines for use on the label; wearing appropriate protective clothing; and only working in appropriate weather. Avoid spraying near watercourses: in these situations select minimal use, direct application methods such as cut and swab.

- Only use herbicides approved for use near a watercourse.
- Spray away from the water and make sure herbicide doesn't run into the water.

Mechanical

Mechanised weeding with large earthmoving equipment may be necessary where large infestations occur, although this isn't common.

Scalping, or the removal of all plants and surface soil with a bulldozer, can be undertaken to ensure crowns and the majority of roots are dug out. Immediately after scalping, a root remover or similar equipment should be used to remove the rest of the roots.

Biological

Biological control involves the introduction of a weed's natural enemies (e.g. fungi, insects). Pests and diseases of the target weed species are identified in its region of origin and introduced into the system after rigorous research**.** Biological control aims to create an ecological balance between a weed and its natural enemies to reduce the

weed population to a level where it is no longer of economic or environmental significance.

- Biological control will not provide instant control. It is a long-term strategy that reduces the population of a targeted weed to lower levels over many years.
- Other management options, such as grazing and herbicide use will need to be used with biological control methods.

Hand weeding

Hand weeding is only effective under very limited circumstances. Even seedlings and small plants can be difficult to pull out by hand. The entire root system should be removed using a mattock or shovel as some weeds will regrow from root fragments left in the soil.

When controlling weeds:

- always work from the least weed-infested areas to worst areas
- prepare a financial plan and allocate funds to weed control.

Step 4 Monitoring and recording

- Monitor changes in the density and area of weed cover.
- Record the occurrence of any new weed species.
- Recording information helps us to understand how a site changes over time.

For more information

on managing weeds in riparian lands contact:

Natural Resources Centre – Clare (head office)
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Primary Industry and Resources South Australia (PIRSA) has also produced a Weed Control Handbook for Declared Plants in South Australia which is available at www.pir.sa.gov.au/__data/assets/pdf_file/0009/187686/Full_Document_Final_Weeds.pdf

www.naturalresources.sa.gov.au/northernandyorke

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