



Water notes

ADVISORY NOTES FOR LAND MANAGERS ON RIVER AND WETLAND RESTORATION

Protecting riparian vegetation

In a healthy ecosystem there is a natural balance of disturbance and regeneration. Unfortunately, past land management practices have disrupted this natural balance by increasing disturbance and as a result the health of riparian vegetation has declined in many areas. Restoring the natural balance requires the reduction of disturbance.

There are a variety of reasons for protecting riparian vegetation and some of the benefits include:

- limiting sedimentation and nutrient enrichment;
- weed management;
- erosion control and sediment trapping;
- providing habitat and habitat corridors; and
- improved recreational amenity.

Common types of disturbance

Clearing

Clearing of riparian and floodplain vegetation for rural and urban purposes is the most common and destructive disturbance. Many states and local councils in Australia are now reacting to this by introducing legislation and planning restrictions on streams. In Western Australia landholders and developers are encouraged to understand the benefits of retaining and maintaining a healthy riparian zone¹.



L. Pen

Channel change

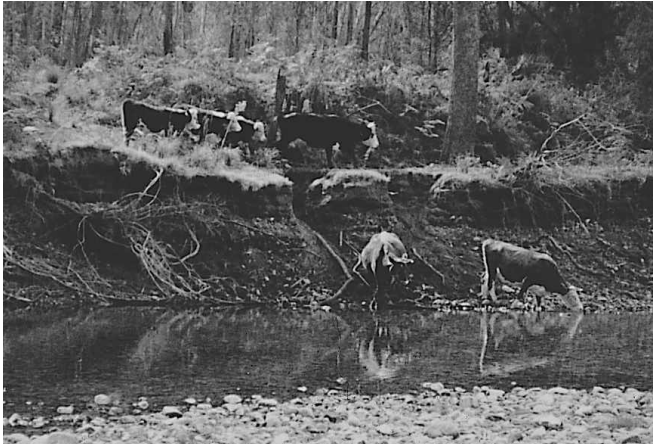
Channel change, either localised or catchment wide, is also a significant form of disturbance of the riparian zone. Channel change includes bed and bank erosion, sedimentation of the channel and floodplain, and channel migration and avulsion (sudden and dramatic change in channel location). While channel change is a natural occurrence that can result in the destruction of riparian vegetation, it is most commonly accelerated by human activities such as catchment clearing, alteration of flow regimes, and stock access. While riparian vegetation is generally a stabilising influence on the channel, large scale channel change can result in loss of bank vegetation and submergence of aquatic vegetation.

Stock access

Unrestricted stock access causes disturbances, which have a number of damaging effects, because livestock:

- graze and trample vegetation, preventing regeneration;
- compact the soils and create pathways;
- transport weed seeds in their fur and faeces; and
- contribute nutrients and bacteria directly to the stream through their urine and faeces.





I. McCarthy

Pest animals

Feral animals such as goats and pigs cause the same problems as stock, however, rabbits are probably the most common pest animals that you will need to address. Rabbits will eat young plants and damage understorey shrubs. Rabbits also disturb floodplains and river banks by burrowing.

Vehicle and public access and adjacent landuse

Uncontrolled vehicle access can result in serious disturbance. General public access can also be detrimental if the activities are inappropriate and occur over a long period. Disturbance may also occur through the spillover effects of adjacent land use activities. Disturbances may include the:

- creation of tracks and paths;
- crushing and trampling of vegetation;
- spill over mowing from adjacent parks and gardens;
- disposal of rubbish and garden waste which can be a source of weeds;
- invasion of fringing vegetation by garden plants from parks and ordinary home gardens;
- lighting of fires; and
- soil compaction.



L. Pen

Fire

Australian vegetation is generally well adapted to deal with the effects of fire. However, an increase in the intensity and/or frequency of fire can reduce the successful regeneration of some plant species and encourage introduced grasses.

Problems resulting from disturbance

Erosion

Erosion is commonly caused by the exposure of soil due to the loss of vegetation. Some erosion may also be the direct result of a specific event, such as stock pushing soil off riverbanks or fishers digging for worms. Once it begins, erosion can cause the following problems:

- loss of top soil;
- undercutting and slumping of riverbanks;
- sediment deposits downstream;
- realignment of the river; and
- increased turbidity of river water.

Pollution of the waterway

Pollutants and nutrients are washed into the waterways from surrounding land. Stock access can cause direct contamination of stream water as their urine and faeces contribute nitrogen, phosphorus and bacteria directly to the stream. This can result in:

- poor water quality, including oxygen depletion;
- health problems in stock, such as liver fluke and diarrhoea; and
- the excess growth of weeds and algae.



Trampling causes loss of fringing vegetation and pollutes the water.

L. Pen

Weeds

Increased disturbance of native vegetation encourages the invasion of weeds, which can:

- increase fuel loads and tinder for fires (e.g. annual grasses);



- displace native plants, especially understorey species;
- increase organic pollution when the weeds die back or drop their leaves into water; and
- reduce habitat for native animals

Fire

Weeds, especially grasses, that dry off in summer provide a greater quantity of fine fuel which will carry fire easily. After burning these grasses return in even greater abundance, encouraging more frequent and more intense fires (Hobbs, 1995).

While fire events are part of the natural cycle of regeneration for much of Australia's vegetation, they have not necessarily evolved with current fire regimes and as a result fire is a prime cause of degradation to bush areas (Hobbs, 1995). Some of the immediate effects of disturbance by fire are:

- loss of vegetation;
- loss of habitat;
- soil erosion; and
- increase in organic and inorganic pollution to rivers (e.g: charcoal and ash).

Compacted soils

Compacted soils result in:

- decreased infiltration of rainwater into the soil and flow through the soil;
- increased surface runoff; and
- reduced vegetation growth.

Loss of habitat and ecological values

Removal of fringing vegetation can lead to loss of aquatic and terrestrial habitat by removal of nesting and roosting sites, removal of leaf litter and woody debris, loss of shade and organic input.

Protecting riparian vegetation

Fencing

Fencing is the most effective means of protecting riparian vegetation. Fences can be used to exclude and control livestock movement and grazing and to guide human activities into appropriate areas. Fences serve to delineate land uses and prevent human activity from encroaching upon the riparian zone. The type of fencing used will differ according to its purpose. For example, if delineation but not stock exclusion is required, then a row of logs or rocks

may be sufficient. If excluding feral animals is necessary, then sophisticated and expensive vermin proof fencing may be required.

There are many different fencing options and it is important to identify the specific management requirements so that the location and design of fencing and gates, is appropriate and effective.

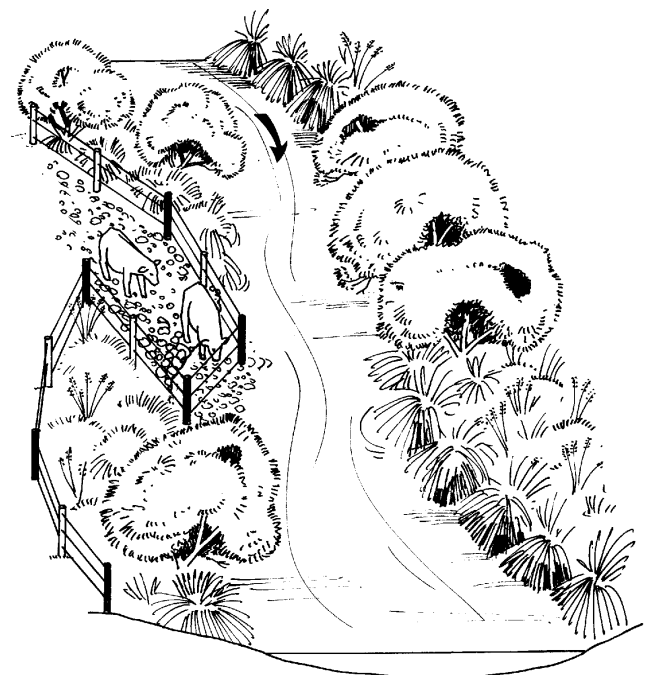


L. Pen

Stock watering points ⁱⁱ

Some sections of river may be suitable for stock access. These include the inside of meander bends (where sediment is deposited) and hard stony areas. Other ways to protect riparian vegetation and the riverbanks while still providing a watering point for stock are by installing a:

- pump and trough in the paddock;
- bore and tank in the paddock;
- dam in the paddock;
- paved ramp down to the water; and
- rocky access point down the moderate slope of a river bank.



Stock watering point.

Crossing pointsⁱⁱⁱ

Crossing points should be located on a straight stretch of river that is not eroding and preferably where the channel has a hard bottom and the banks are not steep. Due to the concentration of animal or vehicle traffic at a crossing point the riverbed and banks will usually need to be stabilised, commonly with stones and pebbles. Fencing should be located so as to prevent animals from moving along the river bed.

Weeding

Weeds can be divided into three main groups: annual pasture species, garden escapees and true aquatic weeds. The method of weed control or removal will depend on the type of weed problem but some methods of weed control for terrestrial species are:

- manual removal by hand weeding, removal with a knife or trowel, removal by crown cut or digging out the entire plant;
- mulching;
- herbicide spraying or wiping (care must be taken to avoid herbicide drift and chemicals that may leach into the waterway);
- cut stump wiping or stem injection is suitable for trees or large shrubs; and
- slashing or crash grazing (can prevent plants setting seed and reduce fire fuel loads, although this method is not suitable for areas with a native understorey).



Baigup Reserve — bulrush before weeding.



Two years after weeding.

True aquatic weeds are uncommon in south-west WA and many are 'declared plants' that should be reported to Agriculture WA. Specialist advice should be sought for appropriate methods of control.^{iv}

Preventative management is the best method of weed control. This means:

- garden rubbish and clippings should NEVER be disposed of in riparian zones;
- not planting invasive exotic species in parks and gardens along streams;
- removing problem plants immediately to prevent them from spreading and taking hold;
- clearing weeds around native seedlings for the first two years to dramatically improve growth and survival rates;
- maintaining overstorey native trees that will help to shade out many weeds; and
- taking care when spraying orchards and horticultural crops as spraying for weeds on adjacent land can sometime kill fringing vegetation, and especially seedlings, if the spray is allowed to drift over the riparian corridor.

Rehabilitation

To address stream degradation, a variety of erosion control and channel management works are available, depending on the cause of the problem. There are other fact sheets and information available from the Water and Rivers Commission (regarding river restoration). However some general rules to follow when rehabilitating riparian zones are:

- gain the best available understanding of a waterway system by working in a multidisciplinary team;
- treat the causes of the problems, not just the symptoms;
- ensure you have the support and understanding of the landholders and community involved;
- protect the 'good' areas first;
- work from good areas towards degraded areas, with an emphasis on those reaches that are showing signs of recovery;
- work in a downstream direction from a break in the riparian corridor (e.g. a bridge) to prevent or at least slow the reinvasion of weeds from upstream; and
- weeds removed should be replaced with native vegetation (the rate of weed removal could be governed by the rate of native plant species regeneration).



Further reading

Available from the Water and Rivers Commission

ⁱ Water and Rivers Commission (1999) *Planning and Management: Foreshore condition assessment in urban and semi-rural areas of south-west Western Australia*. Water and Rivers Commission River Restoration Report No. RR 2.

Water and Rivers Commission (1999) *Planning and Management: Foreshore condition assessment in farming areas of south-west Western Australia*. Water and Rivers Commission River Restoration Report No. RR 3.

Waterways Commission (1994) *Guidelines for determining a protection precinct*. Waterways guidelines (3) June 1994.

Water note WN6 *Livestock management: Construction of livestock crossings*.

Water note WN7 *Livestock management: Watering points and pumps*.

Water note WN8 *Habitat of rivers and creeks*.

Water note WN9 *The value of Large Woody Debris (Snags)*.

Water note WN11 *Identifying the riparian zone*.

Water note WN12 *The values of the riparian zone*.

Water note WN13 *The management and replacement of Large Woody Debris in waterways*.

Water note WN15 *Weeds in waterways*.

ⁱ Water note WN2, *The Value of the Riparian Zones*.

ⁱⁱ Water note WN7 *Livestock Management: Stock watering points*

ⁱⁱⁱ Water note WN6 *Livestock Management: Crossing points*

Available from other sources

Land and Water Resources Research and Development Corporation (1996) *Managing riparian land*. Riparian Management Series (1) September 1996.

^{iv} Agriculture Western Australia (1997) *Weednote: Serious aquatic weeds of Western Australia*. Agdex 674 No.1/97

Hobbs, R. (1995) *Fire*. Pp145-148 in Managing Perth's Bushlands M. Scheltema & J. Harris (Eds) Greening Western Australia.

Raine, A.W. and Gardiner, J.N (1995) *Rivercare - Guidelines for Ecologically Sustainable Management of Rivers and Riparian Vegetation*, Occasional Paper Number 03/95. Land and Water Resources Research and Development Corporation, Canberra.

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This water note is produced as part of the Waterways WA Program. Managing and enhancing our waterways for the future.
Text by Jodie Oates. Illustrations by Dickinson Art. Water note project coordination by Jodie Oates and Heidi Oswald.

Printed on recycled paper January 2000

ISSN 1442-6900

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For further information on any particular issue please contact the Restoration & Management Section at the Water and Rivers Commission.