

8.3 GULLY EROSION

What is Gully Erosion ?

Gully erosion is the dislodgment and movement of soil by water flowing in drainage depressions and flow lines.

What causes gully erosion ?

Gully erosion often starts as a 'nickpoint' or 'drop off' in a drainage depression. These can sometimes be caused by stock tracks, vehicle tracks and plough lines. Once gully erosion starts at these 'nickpoints', activities which reduce ground cover such as cultivation, overstocking and clearing, accelerate the problem. Increased run-off and highly erodible soil types also contribute to quicken the rate of erosion. Water then moves this sediment into farm dams, rivers and water storages causing water quality problems.

The primary causes of gully erosion in the Yass area relate to:

- Clearing
- Access tracks
- Overstocking
- Cultivation
- Development and road drainage
- Vegetation decline
- Soil types susceptible to erosion

What is the impact in the Burrinjuck area ?

The main impacts on landholders are farm management issues. These include access across or around gullies, danger to stock and water quality of farm water supplies. There is also a loss of productive agricultural land and a visual eyesore.

The extent of gully erosion in the Burrinjuck sub-catchment has been mapped using catchment surveys and previous research (see table following).

The total length of gully erosion in the Burrinjuck sub-catchment is 510.6 kms.

Of this:

- 135 kms minor gully erosion (26%)
- 146 kms moderate gully erosion(29%)
- 127.8 kms severe gully erosion (25%)
- 101.7 kms very severe gully erosion (20%)

Priority

The landcare groups in the Burrinjuck sub-catchment have identified gully erosion as a priority issue for management and a focus for on-ground works.

Local Actions to Date

2000/2001

- Burrinjuck Gully Stabilisation Project

1999/2000

- Burrinjuck Gully Stabilisation Project
- Merung / The Brook Gully Restoration
- Sawpit Creek Gully Works

1996/1997

- Murrumbateman - gully fencing, revegetation & erosion control.

See also in the Appendix:

Section 7.4 *Gully and soil erosion*

Table 18 *Soil erosion in the Yass area catchment*

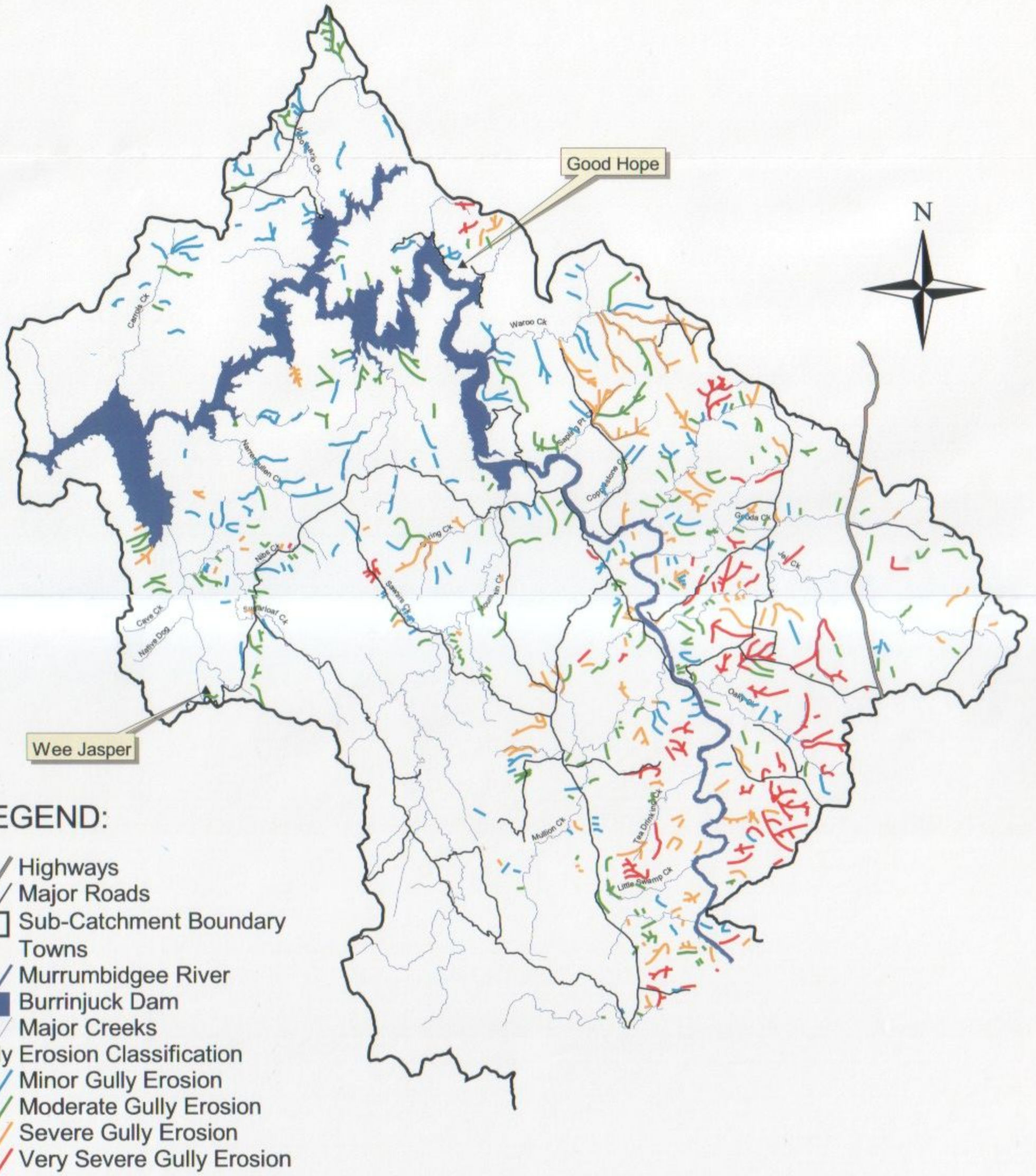
Table 19 *Gully erosion in the Yass area catchment*

Table 4: Extent of gully erosion in the Burrinjuck Sub-catchment.

EROSION CLASSIFICATION	LENGTH KMS	% OF EROSION
Gully Erosion: (Total)	510.6 kms	
Minor: total	135.0kms	26%
Depth: - <1.5 metres	124.1	(92)
- 1.5-3 metres	10.3	(7)
- 3-6 metres	0.6	(1)
Moderate: total	146.0kms	29%
Depth: - <1.5 metres	111.5	(76)
- 1.5-3 metres	33.0	(23)
- 3-6 metres	1.5	(1)
Severe: total	127.8 kms	25%
Depth: - <1.5 metres	63.2	(50)
- 1.5-3 metres	55.5	(43)
- 3-6 metres	9.1	(7)
Very Severe: total	101.7 kms	20%
Depth: - <1.5 metres	11.5	(11)
- 1.5-3 metres	39.5	(39)
- 3-6 metres	25.9	(26)
- >6 metres	24.8	(24)

BURRINJUCK SUB-CATCHMENT

Map 19: Gully Erosion

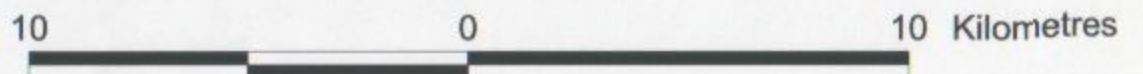


LEGEND:

- Highways
- Major Roads
- Sub-Catchment Boundary
- Towns
- Murrumbidgee River
- Burrinjuck Dam
- Major Creeks
- Gully Erosion Classification**
- Minor Gully Erosion
- Moderate Gully Erosion
- Severe Gully Erosion
- Very Severe Gully Erosion

SOURCE: DLWC, 1999 & NRPA, 2000

SCALE 1:200000



DISCLAIMER
The Yass Area Network of Landcare Groups and/or contributors accepts no responsibility for the result of action taken or decisions made on the basis of the information contained herein or for errors, omissions or inaccuracies presented here. Whilst all care is taken to ensure a high degree of accuracy, users are invited to notify of any map discrepancies.

3. GULLY EROSION ACTION PLAN

WHAT WILL WE DO ?

WHY ARE WE DOING IT ?

Prevent, treat and manage active gully erosion.	To minimise on-farm management problems associated with gully erosion and reduce water quality impacts.
---	---

HOW DOES IT CONTRIBUTE TO MURRUMBIDGEE CATCHMENT BLUEPRINT TARGETS ?

Water quality ✓	Biodiversity ✓
-----------------	----------------

HOW WILL WE DO IT ?

(codes in brackets indicate Matching Blueprint Actions)

Identify the problem

- GE1. Continue detailed surveys using Gully Erosion Assessment Kit.
- GE2. Evaluate gullies in regard to degree of activity and connection.
- GE3. Evaluate gullies as to potential for sediment entrapment and storage.
- GE4. Update vegetation and soils mapping.

Implement management practices

- GE5. Control stock access and maintain groundcover. (WMA1, WMA4)
- GE6. Retain and enhance existing riparian vegetation in discharge areas. (WMA1, WMA2)
- GE7. Retain native vegetation on land with high susceptibility to erosion. (WMA1, BMA1)
- GE8. Implement remedial measures in high priority areas.

Carry-out on-ground works

- GE9. Remediate most severe gullies, which have been mapped and assessed using revegetation and soil works. (WMA3, WMA6, WMA7)
- GE10. Undertake gully control earthworks where necessary. (WMA6)
- GE11. Fence and revegetate gullies to assist in reducing erosion and sediment movement. (WMA3)
- GE12. Fence and revegetate all moderate to minor erosion problems. (WMA3, WMA7)
- GE13. Divert surface water flows away from gully 'head'.

Promote and educate

- GE14. Use successful projects as encouragement for others embarking on work.

Monitor

- GE15. Evaluate techniques for sediment entrapment.
- GE16. Evaluate results of structural gully treatment.

BEST MANAGEMENT PRACTICES

GULLY EROSION

What is Gully Erosion ?

Gully erosion is the loss of soil along water channels caused by water. It is caused by continuous cropping, overstocking or clearing leading to vegetation decline along water channels and erosion.

Why do we need to fix it ?

Sediment transported by gullies causes problems in watercourses, farm dams and water storages. It also causes management problems on-farm such as access across or around the gully, danger to livestock, a decrease in farm water quality and a visual blight on the landscape.

What can you do?

- Improve grazing/cropping management practices to control erosion
- Reduce grazing pressure to allow for regeneration
- Fence off pockets of remnant native vegetation near gullies to assist in holding the soil together and as a seed source for gully revegetation
- Divert water from the gullies to allow stabilisation (structural earthworks)
- Revegetate gullies using native species appropriate for the local area.
- Reduce siltation and sediment build up in streams
- Arrest active gully erosion (headward advancement or deepening)

A Gully Erosion Assessment Kit is available to help you identify the severity of gullies on your property. Contact DLWC.

Who Can Help ?

Department of Land and Water Conservation,
Yass Office phone 6226 1433

REPAIRING GULLY EROSION

Before you begin repair works, consider the characteristics of each gully. What is its size (length, depth, width), soil type, the size of the catchment, and the amount of runoff. These will dictate which option you might undertake to repair the gully. The following options are suitable for small to large gullies. Refer to the Gully Erosion Assessment Kit available from DLWC to help you assess your gully.

Fencing - In most cases fencing out the gully will assist in stabilisation of the gully sides and allow vegetation to establish. It is also important to keep stock from the gully, particularly if it is eroding.

Gully diversion and shape - Water is diverted away from gully head to a safe disposal area via a diversion bank on low grade. The gully below the bank can then be shaped and revegetated. This is a good option for small to medium gullies. It allows gullies to become productive providing topsoil is stockpiled and spread back over the site after the gully is reshaped.

Rock Flume – provides a more stable base. Rock should be placed on filter fabric so that water flows over it and not around the sides. This is a cheap alternative to concrete, however, they should not be designed for large or prolonged volumes of runoff.

Concrete Flume – forms a long life stable structure for highly active gullies where there are high volumes of water. These need to be properly designed and constructed. Contact DLWC for advice.

Dam -This can be built above the gully to stop the water flowing over the gully head or can be built in the gully with top water level drowning the active head. Storm water can be diverted away from the gully, or contained in the dam and released into the gully slowly over time through a trickle pipe.

Low Cost Wire Weirs - For gullies where earthworks are impractical or uneconomic, such as large gullies, or where the gully head is off the property, other measures can be taken. Gully bed and gully wall stabilization can be undertaken with low cost wire weirs. These are built from a combination of steel posts, reinforcing mesh, wire netting, concrete blocks, etc. They catch sediment, reducing the grade on the gully floor. This slows water down decreasing its erosive force.

Revegetation - Trees, shrubs and grasses assist in gully control in several ways. They; hold soil together with roots, dry out wet areas, protect the soil surface, and act as silt and debris traps.

Future Management - The fill area and water entry points to the creek/stream should be fenced out (at least temporarily) and de-stocked for a minimum of 12 months to allow establishment of ground cover. After this time the site may be brought back into production to a limited extent. Grazing should be undertaken on a rotational or crash grazing basis with the emphasis being on maintaining at least 70% ground cover, and not grazing grasses lower than 4.5 cm in height.

Once works are complete they need to be looked after to increase their life span. Overgrazing and stock tracks can erode the works, reducing their effectiveness.

Who can help?

Department of Land and Water Conservation, Yass (02) 6226 1433

Soil Note 15/85 'Gully Control – Why Wait': Farm Trees series No. 4 'Tree Planting for Gully Erosion Control'.

FACT SHEET

SUITABLE SPECIES FOR REVEGETATING GULLIES

Good vegetation coverage is very effective in providing long-term gully stability. The combined root systems of trees, shrubs and grasses bind together cobbles, gravel, sand and soil.

TOE

The area where the gully floor and side walls meet (the toe), is the most susceptible part of a gully to erosion. Stabilisation requires the establishment of a good cover of vegetation. Some good species to use include;

COMMON NAME	SCIENTIFIC NAME	REVEGETATION INFORMATION
Alpine Bottlebrush	<i>Callistemon ptyoides</i>	Prefers periodically wet ground near swamps and watercourses
Broad-leaf Cumbungi	<i>Typha orientalis</i>	
Common Reed*	<i>Phragmites australis</i>	Likes damp to saturated soil and will also grow in deep brackish water. Is commonly seen growing along stream banks in the region, very useful at stabilising stream banks and undercuts, and can tolerate deep shade
Common Rush	<i>Juncus usitatus</i>	Will grow in shallow water as well as the bank because it likes damp to well saturated soil
Cumbungi*	<i>Typha spp.</i>	Grows on damp or saturated soils, usually in stationary or slow flowing water up to two metres deep, has the potential to blanket areas of slow moving water
Purple Loosestrife	<i>Lythrum salicaria</i>	damp mud or wet sand, perennial herb to 1.5m, dies back in winter, re-shoots from crown
Red Stem Wattle*	<i>Acacia rubida</i>	dry, alluvial soils, including steep well drained banks
Rice Sedge	<i>Cyperus difformis</i>	poorly drained soils, grass-like perennial tussock, to 2m
River Clubrush	<i>Schoenoplectus validus</i>	damp or saturated soils, perennial to 3m, survives periodic wet, prevents erosion
River Tea Tree	<i>Leptospermum obovatum</i>	sandy, gravelly sites and rock outcrops, excellent for protecting stream banks,
Rushes	<i>Juncus spp.</i>	damp or saturated soils, perennial to 1m, survives periodic wet conditions
Silver Wattle	<i>Acacia dealbata</i>	dry sites, frost and drought hardy, vigorous spreading and anchoring root system, regenerates easily by seed and suckering
Spiny Headed Mat Rush	<i>Lomandra longifolia</i>	height to 80cm, dense, fibrous root system
Tussock Sedge Tassle Sedge Tufted Sedge	<i>Carex appressa</i> <i>Carex fascicularis</i> <i>Carex gaudichaudiana</i>	Sedges: generally grow in poorly drained soils along streams and wetlands, copes with periodic wet and dry conditions. Tassle and Tufted Sedge: perennial tussocks, helps prevent erosion

BANK FACE

Shrubs and grasses are generally best for revegetation of banks. Many of the following species can also be planted as River Corridor Species.

COMMON NAME	SCIENTIFIC NAME	REVEGETATION INFORMATION
Australian Anchor Plant	<i>Discaria pubescens</i>	near streams, shrub 1-2m
Bertya	<i>Bertya rosmarinifolia</i>	prefers near streams, height 1-2m
Blackthorn	<i>Bursaria lasiophylla</i>	thorny shrub, grows readily along river, creeks and gullies, wide spreading root system that binds the soil effectively, 2-4m
Box Micrantheum	<i>Micrantheum hexandrum</i>	rocky sites near streams, shrub 2-4m
Burgan	<i>Kunzea ericoides</i>	near streams, shrub 2-4m, may invade cleared country
Cauliflower Bush	<i>Cassinia longifolia</i>	shallow soils, shrub 1-3.5m
Common Cassinia	<i>Cassinia aculeata</i>	shrubs 1.3-5m
Common Fringe-myrtle	<i>Calytrix tetragona</i>	rocky, gravelly soils and sand, shrub 1-2m
Crimson Bottlebrush	<i>Callistemon citrinus</i>	damp, sandy flats and near swamps, shrub 1-3m
Dagger Wattle	<i>Acacia sicutiformis</i>	prefers sandy or rocky soils, very hardy
Giant Hop-Bush	<i>Dodonaea viscosa</i> subsp. <i>spatulata</i>	rocky outcrops, dry sandy soils, shrub to 6m
Hemp Bush	<i>Gynatrix pulchella</i>	near streams, shrub 2-4m,
Long-leaf Lomatia	<i>Lomatia myricoides</i>	Will grow on poorer soils, along creeks and gullies, shrub 2-5m, intolerant of high phosphorus alluvial sites
Narrow-leaf Bitter Pea	<i>Daviesia mimosoides</i>	various soils, shrub to 2m, hardy, useful for poor open sites, regenerates quickly after fire
Narrow-leaf Hopbush	<i>Dodonea viscosa</i> subsp. <i>angustissima</i>	rocky outcrops, dry sandy soils, shrub 1-4m
Ovens Wattle	<i>Acacia pravissima</i>	common near streams and on damp sheltered sites, shrub to small tree 3-8m
Prickly Grevillea	<i>Grevillea juniperina</i>	sand or rock near rivers, creeks, shrub 1-2.5m, suitable for low phosphorus soils
Poa Tussocks* (Tussock Grass)	<i>Poa sieveriana</i> , <i>Poa labillardiera</i>	perennial, prefers dry, alluvial soils on stream banks and low-lying sites, unpalatable for stock
Pomaderris species	<i>Pomaderris andromedifolia</i> , <i>angustifolia</i> , <i>subcapita</i> , <i>aspera</i> , <i>eriocephala</i> , <i>betulina</i>	in scrub, usually near streams, shrub 1-4m
River She-Oak	<i>Casuarina cunninghamiana</i>	along streams, roots bind banks
River Tea-Tree	<i>Leptospermum obovatum</i>	sandy, alluvial soils and rocky outcrops, periodically wet sites along watercourses, shrub 2-3m, excellent for streambank protection, thinning may be

		in riverbed
Slender Tea-Tree	<i>Leptospermum brevipes</i>	near streams, damp or rocky sites, shrub 2-4m
Small-fruited Hakea	<i>Hakea microcarpa</i>	rocky soils, next to watercourses and swamps, shrub to 2m, not tolerant of phosphorus, therefore no suited to rich, alluvial soils
Swamp Paperbark	<i>Melaleuca ericifolia</i>	poorly drained soils, swamps and stream flats
Swamp Tea-Tree	<i>Leptospermum myrtifolium</i>	periodically wet soils, near streams, swamps and soaks, shrub 1-2.5m, may invade cleared, wet areas
Tussock Grass	<i>Poa labillardieri</i>	grows readily along stream banks, unpalatable for stock
Woolly Grevillea	<i>Grevillea lanigera</i>	Small shrub, grows readily in lighter soils along watercourses, well draining sandy or rocky soils with clay subsoil, will regenerate naturally during good seasons, soil with low phosphorus content
Woolly Tea-Tree	<i>Leptospermum lanigerum</i>	wet, sandy or alluvial soils and rocky sites, shrub 2-6m

Who can help?

Landcare, Yass Office C/- DLWC (02) 6226 1433

Department Land and Water Conservation, Yass. (02) 6226 1433

FURTHER REFERENCES

Rizvi, S.A and Crouch R.J. *Gully Stabilisation: 20 Promising Native Species*. CaLM Technical Paper 2, Department of Conservation and Land Management, Sydney, 1993.

IMPORTANT THINGS TO KNOW ABOUT REPAIRING GULLIES

❖ Active gullies take priority.

While filling a stable gully is possible, it is a low priority as there is no environmental benefit compared to treating an actively eroding gully.

❖ Design and Construct Earthworks.

Have all earthworks designed and construction to Council/DLWC standards. In the site plan allowance should be made for vehicular access so that heavy trucks do not create an erosion problem.

❖ Catchment Size >25 ha.

Catchments above 25 ha can periodically yield large volumes of water, which is difficult to control. Any works would require a detailed design to cater for appropriate storm events (ie. 20 year return period).

❖ Catchment Size 15 – 25 ha.

Jobs should be designed and approved by Council and DLWC.

❖ Catchment Size <15 ha.

Below 15 ha catchment, DLWC minimum standards is recommended and no further design is usually necessary.

❖ Suitable Dam Site.

A site is suitable for a dam if the site is flat <5% and/or in a minor gully or flow line where there is suitable earth material for dam construction (ie. clay).

What is a

Diversion Bank? A bank constructed by a dozer or grader, which is designed to safely divert runoff water from one point to another.

Flume? A stable area which allows water to flow into the bottom of a gully without causing erosion.

Bank and Pipe? A diversion bank with a pipe (usually 150-mm poly pipe) to cater for flows from minor run-off events or from spring flows, which protects the outlet from eroding.

Who can help?

Landcare, Yass Office C/- DLWC (02) 6226 1433
Department Land and Water Conservation, Yass. (02) 6226 1433