LAND MANAGEMENT

SUSTAINABLE LAND
Controlling Gully Erosion with Debris Dams

Main Points

Gully erosion in soft rock hill country can be controlled using debris dams, a traditional method. Debris dams need to be sited in the best place, and need to be well constructed, with plantings of willows to help stabilise the gully floor.

The Problem

In coastal hill country gully heads often move rapidly, cutting into the valley floor and side slopes. The result is large amounts of debris are carried onto lower flats, tracks are cut, slopes are made unstable and productive land is lost.

This type of gully erosion is difficult to control as success depends on:

- building up the gully floor to make the sides stable
- slowing the speed of water movement to stop downcutting and allow infill
- stopping the gully head moving upslope
- creating a site stable enough to establish trees so the side slopes and gully dam floor can be stablised, enabling pasture to develop again.

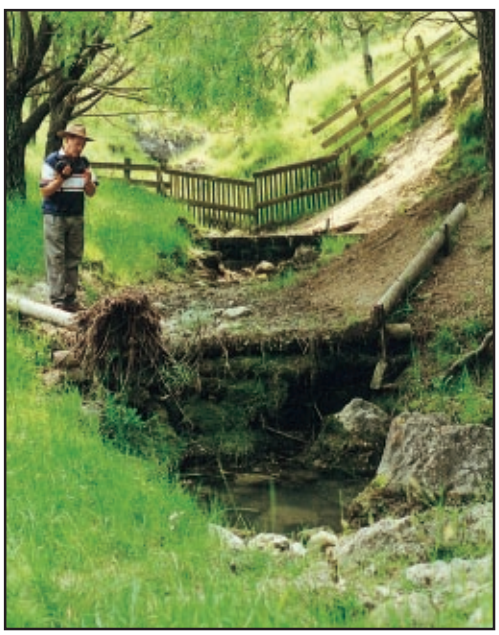
Controlling the Gully

It is essential to first build up and stabilise the gully floor. This can best be done using debris dams which create a series of stable steps with near flat reaches between them.

A debris dam is a 400-500mm high structure built across the gully with side walls angling up the sides to above the flood level. Many types have been tried. The structure can be of two types: either rails only with three heights of 150 x 25mm ground treated radiata pine, or a combination of rails and netting up to 400-500mm high.

A newly constructed rail & netting debris dam

Two 15 year old rail & netting dams still working very effectively



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Siting of Debris Dams

Rail and Netting Debris Dams:

To reduce the risk of undercutting of the dam, place docking netting across the gully bottom for 3m upslope from the proposed dam wall and 2m downslope.

The bottom rail of 150 x 25mm ground treated timber is laid horizontally across the floor and tied to standards with No. 8 wire (see diagram).

The bottom wing rail is cut into the bank at an angle of about 20^0. Next, the top wire wing rail is tied to the standards 400-500mm horizontally above the bottom rail. A full width of cyclone netting is stapled from one wing across and up the other wing. Each wing and the head wall is tied back upstream with No. 8 wire to a standard driven in at 45^0 angle for its full length.

The advantage of the netting dam is that water flows through it as it fills up causing a minimum of stress to the structure. However it is more expensive.

Rail Debris Dams:

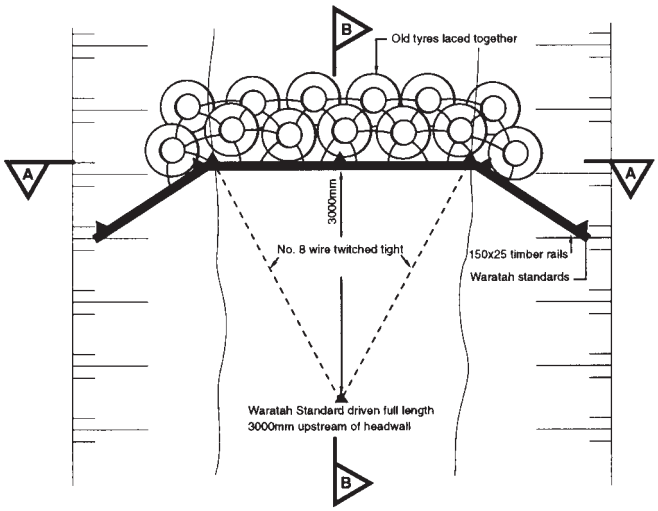
A simple way is to build the head and wing walls with 150 x 25mm ground treated radiata pine using half round posts instead of standards.

This is quicker and cheaper to build, but there is more pressure on the dam wall as it fills and it is more likely to scour out than the rail and netting dams during floods while they are filing with debris.

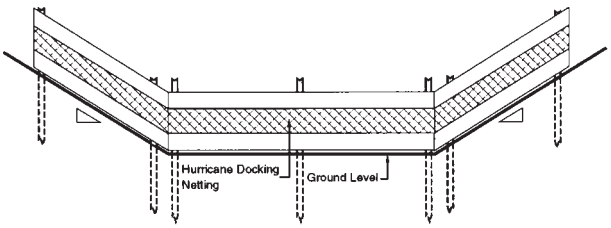
Ensure the top rail is horizontal with a central area (eg 2m) cut lower to ensure flows do not cut into the side bank.

Ensure the tie backs are secure and do not cross the central flow areas.

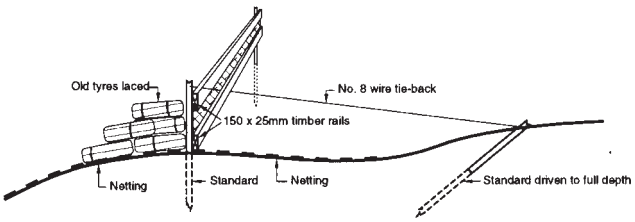
Additional plunge pool protection can be achieved by laying two to three layers of tyre cases across the lower side of the dam wall. These are securely lashed together. Eventually the tyres will fill with silt.



Plan



Section A- A



Section B - B

Tree Planting

Plant three metre tall Matsudana willow poles if there is sheep access or one metre stakes (no stock access) along the gully sides with pairs at five metre spacing and spaced along the gully side walls. The willow roots help stabilise the gully floor as they form a mat of roots.

Timing of Building Dams

Dams are only effective when they are full. Don't build a whole sequence of dams at once. Miss out each second dam and build these when others are full.

Maintenance

Check the dams after each storm to ensure the walls are still secure and the waterway clear.

Debris on the dam wall can divert water into the side wall causing increased scour. Replace trees as needed and prune up to ensure sufficient light is available for pasture growth.

Typical Materials and Costs

Materials and costs vary depending on size of structure and gully width. These materials and costs related to a dam 16 metres from wing to wing.

Rail and Netting:

16m of 150x25mm rails (ground treated)
Eleven standards
Wire binding
Number eight wire
Cyclone netting
Docking netting
Post staples
Number two posts
Total costs approximately $400.00

Rails Only:

4 No. 2 posts (ground treated)
18m of 150x25mm rails
Docking netting
Post staples
Total costs approximately $200.00

For further information

For further information on control of gully erosion, ask for the other titles in this series or contact Hawke's Bay Regional Council Land Management staff for advice.

Wairoa	0-6-838 8527
Guppy Road, Napier	0-6-844 2495
Waipukurau	0-6-858 8636
TOLL FREE	0800 108 808