Natural Resources
SA Arid Lands

# Erosion control measures for pastoral land

There are different types of earthworks that can be used to reduce wind and water erosion and increase plant growth on pastoral land. Some of these have been used for more than 60 years in SA's pastoral country.

The key to mitigating wind erosion is to lift wind away from the ground where it can pick up soil particles. Barriers in the path of wind deflect it upwards and away from the soil surface. The greater the height of the barrier, the greater the distance behind the barrier before wind can reach the ground again. The greater the number of barriers, the better the protection from erosion.

Water erosion occurs in two ways. The first is raindrops directly hitting soil particles, dislodging and moving them. The second is when water starts to flow and picks up and carries soil particles.

Covering soil particles so they are not directly hit by raindrops will protect them from damage. On pastoral land this cover is normally plant material or stones.

Slowing runoff so it has more time to soak into the soil and less energy to carry away soil particles is essential in preventing soil erosion. The greater the volume and depth of flow, the faster its flow. The steeper the slope that water is running down, the faster the flow. The faster the flow, the greater its erosive potential.

Increasing soakage into the soil will result in less runoff. Spreading flows so they move over the land as shallow, broad streams increases infiltration into the soil. Slowing, spreading and letting flows soak into the soil not only reduces erosion but also provides more water for plant growth. This is sometimes referred to as 'landscape rehydration'.

FACT SHEET
*Erosion Control*

Disc-pitted area after rain.

Photo courtesy Maurice and Janet Francis

A disc pitter being demonstrated at a field day near Mannahill in 1966.

Photo courtesy Maurice and Janet Francis

Furrowing using single tine ripper.

**Pitting** is used on flat, bare, scalded (where topsoil has been blown or washed away) areas. Pits are small depressions formed by scalloped-disc ploughs trailed behind a tractor or utility. The pits trap water, plant litter and soil and form niches for germinating plants.

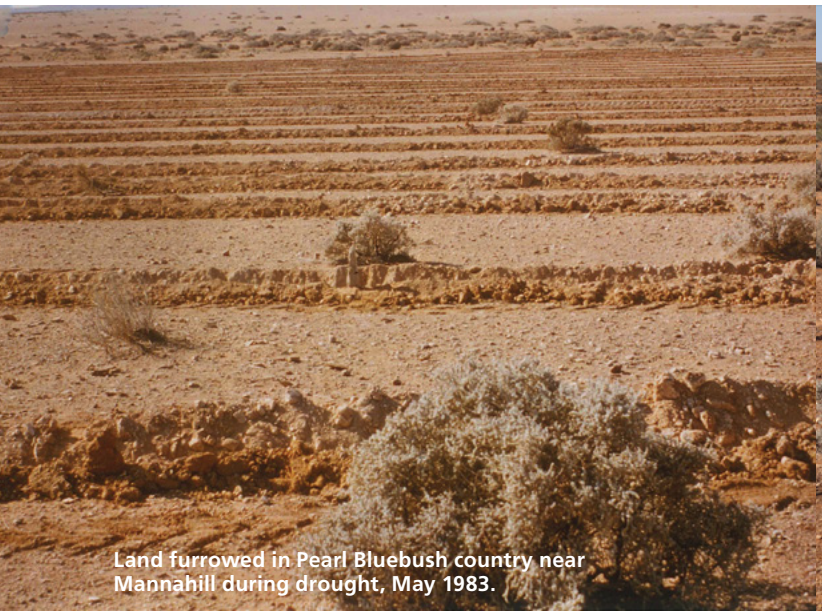
**Furrowing** is a longer-term treatment. Furrows are formed by a ripper tine fitted with 'wings' digging into the soil. This leaves a v-shaped trench with earthen banks thrown up on either side of the rip line. On sloping land, furrows are ripped on the contour to impede runoff and encourage infiltration into the soil. They slow wind and water movement on bare land that mitigates erosion and encourages plant regeneration.

The banks on the edges of furrows deflect wind away from the soil surface. Banks and furrows trap seed, soil and water, provide a seedbed, and protect seedlings from wind.

Considerable draft power is required to pull ripping implements to dig a furrow more than 20 cm deep. Tractors are usually used. Graders and bulldozers often have ripping blades attached but do not have wing plates on the tines to form earthen banks.

As furrows roughen the ground and can remain for many years, they make it very rough and difficult for vehicle traffic. Consideration should be given to providing access for vehicle traffic and mustering in furrowed areas.

Pitting and furrowing are most successful where they are carried out near seed sources that can provide viable seed to germinate in the pits and furrows. Alternatively, collecting seed from other areas and scattering it over the pitted and furrowed areas can be undertaken to encourage plant growth.



Land furrowed in Pearl Bluebush country near Mannahill during drought, May 1983.

The same site, also during drought, in 2019. Thousands of Pearl Bluebush seedlings grew following rain in July 1983 and many were still present in 2019.

**Earthen banks** are used to intercept, divert, spread and slow water flows on gently sloping land. They can direct water away from gullies and gutters towards flatter land where the flows are slowed and can infiltrate the soil. Banks are constructed with a grade or fall to ensure that water is diverted in the desired direction. Technical expertise is required to site structures in appropriate locations, ensure they have correct fall and that flows from the banks are released via wide, level spillways. The structures must be constructed so that they can withstand the force of a large volume of water flowing at speed, hold it to still the flow and then release it at a non-erosive velocity. Shallow wide sumps built in front of the banks hold and slow the flow. Ripping the sump's base with grader or bulldozer tines increases soakage into the soil.

Banks need to be of very solid construction with a broad base to support a height of at least 1.5 metres and should be built by experienced bulldozer and grader operators. Flaws in the construction of earthworks can result in total failure and loss of structures.

**Earthen graded bank with sump formed on uphill side. Sump has been ripped to encourage infiltration of water into soil.**

**Aerial view of graded bank built upstream of gully-eroded area. The bank diverts water away from the gullyhead towards open plains country. The gullied area behind the bank has been bulldozed, levelled and ripped to encourage plant growth.**

**Small watercourse erosion structures** can be used to stop the progression of small gutters. They slow and spread water flows to prevent water racing over edges or "nickpoints" in watercourses. Sieves, mesh barriers, and silt traps are all examples of these structures. A wide, porous structure above the gullying part of the watercourse traps silt and plant litter. This material fills in depressions in the watercourse. The flow of water moves through the porous material in the structure and is released as a cleaner, wider, slower flow. Structures need to be well embedded into the banks and bed of the watercourse so that erosion does not occur around the ends or underneath. They also need to be kept clear of debris that could block water flowing through the structure, such as large logs. Note that a barrier formed with loose rocks is not effective, as the rocks are easily washed away. However, rocks in mesh cages are often used to successfully stabilise watercourses.

View from upstream of cylinder made from wire mesh, pegged down with steel droppers. The mesh traps leaves and sticks while allowing water to flow through.

Branches of shrubs placed above a small gully to slow and spread water flows into it. Grass growth is encouraged by water infiltration underneath the branches and protected from grazing animals.

**Managing runoff from tracks and roads** to avoid water collecting and being concentrated into narrow, deep flows, will reduce erosion. Where possible, construct roads on the contour, at right angles to the direction of flow so that runoff flows across rather than along them. Direct runoff from roads via wide, level channels rather than narrow v-notch ones and towards open country rather than watercourses. Old, unused tracks and roadways that could still shed water can be ripped to encourage water infiltration into the soil.

Selecting the right measure to reduce erosion requires consideration of wind and water movement across the land. Water erosion in particular, requires an understanding of how much, how often and the topography over which water flows.

Earthworks on pastoral land can destroy native vegetation, affect flows of water, or disturb sites of cultural significance. Seek guidance from SA Arid Lands Natural Resource Management staff and check with relevant agencies and authorities before commencing any works.

**Rocks encased in mesh cages and used to construct weirs and mattresses (to 'catch' and slow water flowing over weir). The cages have been embedded into the banks and bed of the watercourse to prevent water erosion around the ends or underneath.**

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