Sediment

STABLE SOILS

Rilling and gullying occurs where runoff from local rainfall concentrates before flowing over a streambank when stream levels are relatively low. The concentration can be caused by a road, track, stock pad or an earthen bank or levee built to divert runoff from adjacent areas over a steep bank. The risk of lateral bank erosion is much greater when the stream is incised. Bare ground can result from clearing of vegetation, grazing, cultivation, recreational use, vehicular traffic, weed control, fire and exotic animals such as feral pigs.

Dispersive clay soils are especially susceptible to erosion and are referred to as being sodic. They are common in many Queensland catchments and their floodplains. Sinkholes in dispersive soils can develop adjacent to a streambank and greatly accelerate the rate of erosion as they collapse and expand.

Vegetation plays a vital role in stabilising streams and providing key ecological functions such as biodiversity and habitat for both terrestrial and aquatic organisms. Engineering solutions are often required to stabilise streams but they are nearly always used in conjunction with vegetation.

To be effective, a continuous cover of a variety of plants is needed over the whole bank. Isolated single plants are likely to be ineffective and can cause localised erosion. Both the foliage and the roots of plants play a role in stream stabilisation.

Different types of vegetation establish and thrive on different parts of the streambank. Riparian vegetation can be classified as overstorey, understorey, ground cover and macrophyte species. Each category has different functions which act together to help stabilise a stream and provide a wide range of ecological functions. There are different zones of the moisture in a riparian situation. Some riparian vegetation species must be adapted to dry sites with seasonal wetness, while others must adapt to regularly saturated sites.

Overstorey species help to stabilise streambanks by the following processes:

- Tree and shrub branches and their foliage work together to help reduce the velocity of flood flows against streambanks. Isolated, single trunk trees provide little benefit.
- Tree roots strengthen streambanks by binding banks together in a similar manner as steel reinforcement in concrete. Fine and dense root systems with high tensile strength provide the most protection. The greater the depth of the roots, the more protection they provide.
- Tree roots can inhibit the development of tension cracks that run parallel to the river bank and which contribute to bank erosion.
- Trees help to reduce the weight of banks by removing excess moisture via transpiration and increased drainage.
- Vegetation on the face of the streambank helps to protect the bank from collapse by supporting or buttressing the soil above it.
- Some trees can survive with exposed roots, which allows ongoing control of bank erosion.

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Understorey species provide mid and upper-bank sections of streams with protection from scour. Shrubs add roughness to the stream channel to help reduce flow velocities.

Vegetation reduces scour by slowing the speed of water adjacent to the streambank. It can also 'ride down' with a collapsed bank and protect its toe from further scour.

Ground cover species, including grasses, control streambank erosion by the following processes:

- They absorb the impact of raindrops falling on the streambanks and the riparian area.
- They control soil scour by reducing flow velocities or folding down flat under stream flow to provide a protective blanket.
- They provide some stability to the bank but this is limited by the shallow root system.
- They stabilise lateral inflow points.

Macrophyte species are shallow-rooted herbaceous plants that grow at the margins of the normal water level or in the stream. They provide protection to lower bank sections that tend to remain wet throughout the year.

Their benefits include:

- helping to dissipate stream energy by flapping rapidly in the flow
- protecting trees from local turbulence-induced scour
- assisting fish passage during flood flows.

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Draft – Soil Conservation Guidelines for Queensland Chapter 13 Stream stability, prepared by Bruce Carey, retired soil conservationist.

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