

# FACT SHEET

## SOIL CONSERVATION AND EROSION CONTROL

### WHAT IS EROSION?

Soil erosion is a natural process where wind and water remove particles from surface soils and deposit them in lower parts of the landscape. While erosion generally occurs slowly, human activities and poor land management can accelerate its effects. Floodplains, often used for agriculture, are particularly susceptible to high-velocity floods that can erode topsoil if ground cover is insufficient. Bare soil is especially vulnerable compared to soils with even moderate ground cover or vegetation. Lighter soils are generally more prone to erosion than heavier soils, although soil chemistry and structure significantly influence erosion resistance.

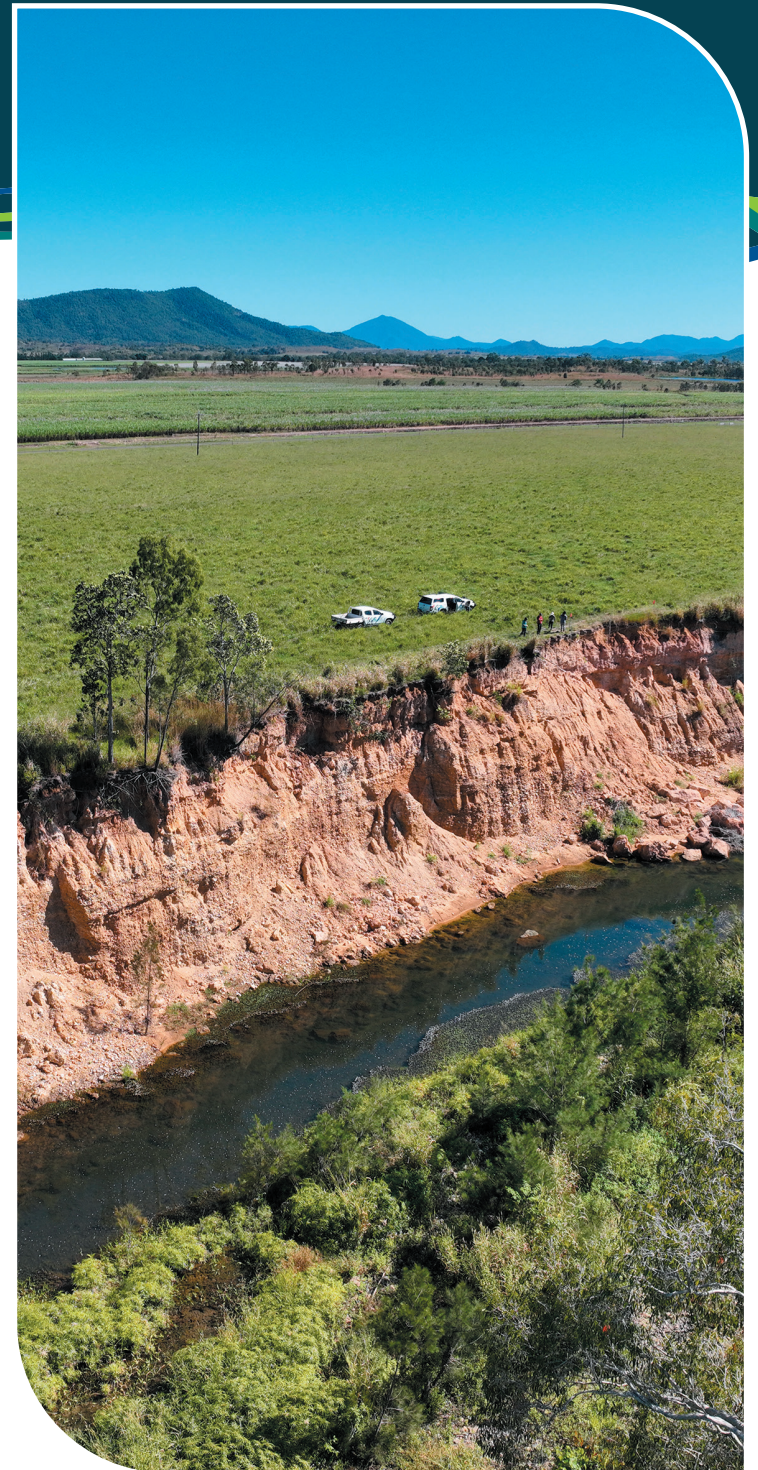
### SOIL TYPES AND CHARACTERISTICS

Understanding soil types and their characteristics is crucial for effective land management, agricultural productivity, and profitability. Erosion of topsoils can expose less fertile subsoils, making land management more challenging. The term 'scalding' refers to the exposure of saline or sodic subsoils due to the removal of topsoil through erosion.

Soil aggregates, or peds, are lumps and clumps formed when soils are disturbed. These aggregates are composed of particles including sand, silt, clay and organic matter. Interactions with water can destabilise the aggregate structure, causing it to slake or disperse. While this is typically unproblematic in natural settings, when disturbed these soils pose challenges to infrastructure and require soil management interventions.

Slaking occurs when aggregates break down into smaller particles without becoming suspended in water. Soils with insufficient organic matter, soil organisms and plant roots have poor structure, which allows water to force air out, causing the aggregate to break apart.

Dispersive soils are structurally unstable due to their chemical and electrical properties, causing them to disperse into basic particles and become suspended in water. Soils that contain



*Figure 1 - Mass collapse erosion on a landholder's property adjacent to the streambank (Reef Catchments, 2024)*

a high proportion of sodium (sodic soils) or magnesium (magnesian soils) in relation to other cations are more likely to act dispersive.



# LIST OF EROSION TYPES

## Sheet Erosion

This involves the uniform removal of a thin layer of surface soil caused by low velocity runoff. Sheet erosion removes fertile topsoil and on slopes can impede soil development, especially on areas with sparse vegetation.



*Figure 2 - A visual representation of sheet erosion on a cultivated paddock (QLD. Gov, 2013)*



*Figure 3 - A visual representation of rill erosion (Reef Catchments, 2024)*

## Rill Erosion

The removal of soil when runoff concentrates into small, narrow rills or channels. It indicates that runoff velocity exceeds the soil's shear point, posing a higher risk on cultivated soils after heavy rain.

## Gully Erosion

Gullies are basically big rills, deeper than 0.3m, and formed when runoff concentrates down drainage lines. They start at the lower end of the drainage line and erode subsoil, moving upslope over time. Rill and tunnel erosion can develop into gullies if left unmanaged.



*Figure 4 - An eroded gully on a landholder's property (Reef Catchments, 2023)*



*Figure 5 - Tunnel erosion (QLD. Gov, 2013)*

## Tunnel Erosion

Typically driven by poor soil chemistry, this occurs when permeable topsoils overlying dispersive subsoil allow water to soak through, washing out the subsoil forming tunnels. Over time, this can lead to the collapse of topsoil and formation of gullies.





### Stream Bank Erosion

The process of removing soil, rock and vegetation from stream banks (lateral erosion). High vertical banks on the outside bend of streams are particularly affected. Other types of watercourse erosion includes vertical (deepening) and headward (lengthening) erosion.



Figure 6 - Streambank erosion (Reef Catchments, 2021)



Figure 7 - Wind Erosion (Reef Catchment, 2020)

### Wind Erosion

Strong winds physically transport lighter, less dense soil particles such as organic matter, clay, and silt. Wind erosion is more common in arid areas of inland Queensland. It poses a significant threat to areas with lighter or finely textured soils.

## HOW DOES THIS AFFECT YOU AND THE ENVIRONMENT?



### Erosion presents challenges to rural lands and the agriculture sector through:

- Reducing available land for agricultural production
- Causing loss of productive soils
- Exposing and deposition of infertile subsoils
- Loss of land and infrastructure affecting land values
- Compromises safety due to steep drop-offs.

### Our waterways have a limited tolerance to increased sediment due to:

#### Coarse sediment

- Smothers channel beds
- In-filling of bed habitats
- Alters hydraulic capacity of channels

#### Fine Sediment

- Transport nutrients, pesticides and other pollutants
- Resulting in mass algal blooms and toxicity impacts

### Corals and coral reefs affected by suspended sediments face the following challenges:

- Reduced light availability
- Smothering corals and their substrate
- Physical damage (abrasion & breakage)





## SOIL CONSERVATION PRINCIPLES

Effective soil conservation involves utilising land according to its capability to prevent environmental instability and degradation, potentially leading to a reduction in agricultural productivity and profitability. A coordinated approach across catchment stakeholders is necessary, as typically runoff passes through multiple properties. A soil conservation plan integrates into farm management systems, addressing personal, financial,

natural resource, environmental management, and other aspects of farm business.

*The three main principles to control erosion are:*

1. Use land according to its capability,
2. ensure soil surface cover, and;
3. control runoff

## TYPES OF CONTROL MEASURES

### Ground Cover

Effective ground cover absorbs the impact of raindrops and wind, preventing soil particles from being dislodged. This can include living vegetation, dry crop or pasture stubble, post-harvest sugarcane trash (green cane harvesting), and various forms of horticulture mulching. Ground cover reduces runoff velocity and encourages the spread of overland flows while capturing transported soil particles.



**Figure 8** - High ground cover pasture in the Mackay-Whitsundays Region (Reef Catchments, 2023)



**Figure 9** - New revegetation planting along West Hill Creek (Reef Catchments, 2024)

### Revegetation

Vegetation stabilises streams, supports biodiversity, provides habitats for both terrestrial and aquatic organisms, and enhances soil stability on steep slopes. Retaining vegetation with strong fibrous roots helps hold soil in place protecting against streambank erosion and slumping. While engineering interventions are often necessary for stream stabilisation, those that incorporate revegetation tend to be the most effective.

### Grazing Land Management

Managing groundcover underpins effective erosion control, pasture species should be selected based on their suitability to the specific climate and soil type. Particularly good coverage of beneficial grasses with deep fibrous root systems, known as '3P' grasses (perennial, productive, palatable) help ensure runoff spreads rather than concentrates. Managing pastures by rotational grazing or opportunistic spelling can result in better ground cover than set stocking rates. Extra care should be taken to avoid overstocking of wet paddocks to mitigate soil compaction or destocking during period of prolonged drought. Pastures should be regularly monitored to ensure stocking rates match the availability of feed. Additionally, strategies like fencing and providing off-stream watering points away from vulnerable areas can help mitigate erosion.



**Figure 10** - An example of grazing fencing within the Mackay-Whitsundays region (Reef Catchments, 2022)





### Whoa Boys

Whoa-boys are shallow trafficable earth banks designed to intercept runoff from roads and tracks, guiding it to a stable outlet and maintaining natural flow direction.



**Figure 11** - An example of a Whoa boy (Reef Catchments, 2021)



**Figure 12** - An example of a contour bank (Reef Catchments, 2020)

### Contour Banks

Contour banks (Bunds) are earthen structures constructed across cultivated slopes to intercept and slow runoff before flow concentrates, preventing erosion. Practical farm management considerations, such as trafficability, should guide their placement and spacing.

### Diversion Banks

Diversion banks redirect runoff away from cultivated areas, soil disturbances, and unstable slopes to stable waterways, natural depressions, or storage areas. They are preferred over catch drains in areas with dispersive subsoils due to their construction avoiding the exposing subsoils.



**Figure 13** - An example of a diversion bank on grazing property (Smith, 2018)



**Figure 14** - A repaired gully on a landholder's property (Reef Catchments, 2023)

### Gully Remediation

Strategies for managing gully erosion involve several approaches:

- Enhancing vegetation cover along the top sides and floor
- Installing fencing to exclude livestock and protect gully systems
- Diverting water from the sides and top of the gully using diversion banks
- Filling after cause has been controlled or diverted or reshaping the gully and stabilising its drainage pathway
- Stabilising both the bed with groynes to trap silt and headworks to carry water to the floor of the gully





## Streambank Remediation

To protect eroding banks, groyves can reduce velocity and trap silt. The bank can be battered back and revegetated with suitable riparian species to help hold the soil in place. In areas with high velocity and fluctuating flows rock and/or engineered structures can be placed against the bank.

*Figures 15, 16 and 17 - Stages of a repaired streambank remediation site over 5 years (Reef Catchments, 2024)*



## OTHER CONSIDERATIONS

Key resources to assist landholders with any additional riparian management questions include the:



Grazing ABCD Framework



MWI Pasture Standards Guide



Cane ABCD Framework



Smartcane BMP



## REFERENCES

Key resources to assist landholders with any additional riparian management questions include the:



2021/2022 Water Quality Report Card



QLD Soil Conservation Guidelines



Erosion gully rehabilitation  
(learnings from sites in MRC)



Interactive mapping – QLD Globe



Streambank Gully Toolbox



QLD Gov Soil Management Erosion

