Rill Erosion

Rill erosion leaves distinct paths where the soil has been washed away, as water concentrates in draws (areas of concentrated flow) and flows down the slope.

The larger the contributing watershed, the greater the slope and more confined the drainageway, then the greater the potential for rill erosion.

You are experiencing rill erosion if:

- you see finger-like patterns on sloping fields after runoff events
- there is an obvious path where water has been flowing
- you need to slow down when crossing a draw due to erosion and runoff.



In many cases, rills are filled in each year as part of tillage operations.



Don't fool yourself: there is a problem.

Gully Erosion

Gully erosion may develop where rill erosion has not been managed.

You have gully erosion when:

- rills (eroded channels in field) are so large that you cannot cross them with your tractor and most implements
- eroded channels have to be filled in with your tractor (and bucket or blade) or heavy equipment.



Steeply sloping cropland with high silt and fine sand soils are susceptible to gully erosion.

On very small watersheds of up to 2 ha (5 ac) and/or broad drainageways

SOLUTION

In small watersheds, BMPs for cropping and tillage – including crop rotations, along with some simple supporting practices in runoff-prone areas – may help to control erosion.



This wide, natural draw path has been left untilled to protect the soil from erosion. The next crop will be planted directly into it.



with crop residue cover from no-till and double-planted wheat.

This area has been left in permanent grass to prevent erosion.

On small, gently sloping watersheds of up to 2% slope and up to 10 ha (25 ac)

SOLUTION

For watersheds of up to 10 hectares (25 ac), a relatively simple way to control rill erosion is the **construction of an earthen berm across the erosion-sensitive draw.** A water and sediment control basin (WASCoB) is a berm that intercepts and ponds runoff, then releases it slowly to a subsurface drainpipe in less than 24 hours. Construction and maintenance tips for an earthen berm and riser inlet can be found on pages 15 and 16.

A WASCoB system consists of an earthen dam or berm spanning a natural drainageway. It intercepts and temporarily ponds concentrated runoff. The standpipe and plastic pipe are sized to drain the ponded area within a 24-hour period. Generally this system will fit irregular landscapes. In some cases it may be preferred over a grassed waterway.





The berm cross-section may be either a broad-based or narrow-based design. The broad-based design with a 10:1 side slope enables the berm to be entirely cropped, and no land is taken out of production. The narrow-based design has 3:1 side slopes and will be permanently vegetated. The narrow-based system has a lower cost as less soil is used in the construction. Include an emergency overflow spillway for all berm systems.

On gently sloping watersheds of 10–20 ha (25–50 ac)

This 20-hectare (50-ac) field slopes to the south. Its slope is 396 metres (1,300 ft) in length. No-till farming across the slope and a series of berms reduce soil erosion to an acceptable level.

Three L-shaped berms were built just inside the fenceline to control rill erosion along the field headlands. They are grassed over, but constructed with 8:1 slopes to allow for machinery crossing and minimize impacts on field operations. Another berm is constructed in line with the lowest L berm to protect another drainageway.



BMPs for Rill and Gully Erosion On steeply sloping watersheds of 10–14 ha (25–35 ac)

This fairly steep 20-hectare (50-ac) watershed required three narrow-based berms (WASCoBs) to protect the drainageway from rill erosion. The berms are parallel to each other and spaced at 91 metres (300 ft). The drainageway extends over 700 metres (2,300 ft) with a slope that exceeds 5%.



BMPs for Gully Erosion For concentrated flow on steep slopes or high drops

Most large rills and gulleys that develop in cropland areas can be controlled with the range of erosion control structures and conservation practices described on previous pages.

There are certain areas – such as very steep slopes in fields or concentrated flows near watercourses – that require structures like the ones listed below.



A large-diameter pipe (drop pipe) is installed to convey water down steep slopes or high drops to prevent ponded water or concentrated flow from forming large rills or gullies.

Grade control structures are often used to control or prevent gully erosion. They are a type of drop structure that reduces waterway grade by providing vertical drops up to 1 metre (3 ft) at selected locations along the channel. In most cases, gabion baskets and angular rock materials are used. These structures should always be backed with a filter cloth material to prevent soil from washing through and causing failure.





A rock chute spillway is a constructed chute using angular stone (riprap) and underlaid with filter cloth. Rock chutes are often placed in riparian areas to convey concentrated surface flows (i.e. large rills or gullies) safely to watercourses. As with all erosion control structures, rock chute spillways are most effective when managed as part of a soil conservation system.

BMPs for Construction

Earthen berms and riser inlets

Construction

- Work with a qualified professional to ensure proper design.
- Ensure that the proposed berm height is achieved and allows for freeboard and settling freeboard is an allowance of a further 15 cm (6 in.) of berm height to provide emergency protection.
- Dress the structure with topsoil to promote vegetative growth.
- Whenever possible, construct earthen berms and terraces in the same direction as crop rows to minimize inconvenience during field operations.
- Install all subsurface drainpipe prior to berm construction to avoid differential settling. Drainpipe sizes can be reduced since runoff is stored and outletted within a 24-hour period.

"Proper design is a big part of the project. If it's not done right, it's not going to work – worse, it will give these projects a bad reputation."





Topsoil must be scraped away and stockpiled for later replacement following construction.



Use subsoils that are free of stones and debris and have a minimum clay content of 10%. Build in 15-centimetre (6-in.) layers, compacting progressively.

BMPs for Maintenance

Earthen berms and riser inlets

Maintenance

Maintenance is essential to ensure the long-term integrity of the structural erosion control system.

- Inspect the berm, inlet and subsurface drainage system regularly for burrowing animals, cracking, settling and other concerns.
- · Consider mowing at least twice a year to control woody vegetative growth.



Check the emergency spillway, especially after extreme runoff events. Carry out necessary repairs immediately.

On gently sloping, large watersheds of more than 14 ha (35 ac)



When the contributing drainage area exceeds 14 hectares (35 ac), a grassed waterway is often required.

On large watersheds of more than 14 ha (35 ac)

SOLUTION

A **grassed waterway** is a broad, shallow, permanently vegetated channel, designed to safely convey concentrated runoff from farm fields to a stable outlet. The waterway will follow the natural drainageway to protect against rill and gully erosion.



Enlist the help of professionals such as erosion control contractors to properly design grassed waterways.



Design details: permanent vegetation and easy to cross with farm machinery. Offset drainpipe to protect it from washing out.

BMPs for Design and Construction

Grassed waterways



This 27-year-old waterway has been functioning as designed ever since it was installed. The waterway has worked well, even though cropping is done parallel to the channel for part of the waterway. Its success can be credited to proper care and regular maintenance, including mowing the grass cover once or twice a season, and keeping all field operations (spraying, cropping and cultivation) away from the grassed area.

BMPs for Maintenance

Grassed waterways

Grassed waterways are designed to carry predicted flows of surface runoff generated from a 10-year frequency storm. The width and depth help control velocities. Generally, side slopes of 10:1 (horizontal:vertical) are recommended. This shape will allow for farm machinery to cross easily. Drainpipe should be placed underneath the grassed waterway to handle low-volume flows.

Regular maintenance is required to ensure the ongoing and long-term functioning of the grassed waterway.

D0:

- Raise farm implements when crossing the waterway.
- Harvest forage crops from the grassed waterway.
- Avoid spray drift.

DO NOT:

- Spray with herbicide.
- Use the waterway as a travel lane or as a turning strip during field operations.



Avoid planting rows parallel to the waterway.

