Soil erosion solutions

Helping North Coast landholders reduce soil erosion

Fact sheet 1: Types of erosion

The word erosion is derived from the Latin *rodere* meaning to 'gnaw', the same root that gives us the word 'rodent'. The main agents of erosion are water, wind and gravity. Erosion is a natural process but is often intensified by human land use practices. This leaflet explains the different types of erosion on the north coast.

Water erosion

The north coast's high rainfall makes the region's soils vulnerable to water erosion. High intensity destructive storms are responsible for a significant proportion of the erosion.

Splash erosion

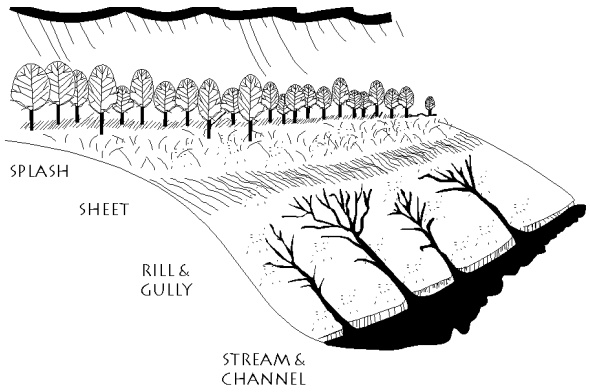
Splash erosion is the first stage of the erosion process. It occurs when raindrops hit bare soil. The explosive impact breaks up soil aggregates so that individual soil particles are 'splashed' onto the soil surface. The splashed particles can rise as high 60cm above the ground and move up to 1.5 metres from the point of impact. The particles block the spaces between soil aggregates, so that the soil forms a crust that reduces infiltration and increases runoff.

Sheet erosion

Sheet erosion is the removal of soil in thin layers by raindrop impact and shallow surface flow. It results in loss of the finest soil particles that contain most of the available nutrients and organic matter in the soil. Soil loss is so gradual that the erosion usually goes unnoticed, but the cumulative impact accounts for large soil losses.

Soils most vulnerable to sheet erosion are overgrazed and cultivated soils where there is little vegetation to protect and hold the soil.

Early signs of sheet erosion include bare areas, water puddling as soon as rain falls, visible grass roots, exposed tree roots, and exposed subsoil or stony soils. Soil deposits on the high side of obstructions such as fences may indicate active sheet erosion.



Types of erosion. Source: http://www.cep.unep.org/pubs/Techreports/tr41en/Image11.gif

Vegetation cover is vital to prevent sheet erosion because it protects the soil, impedes waterflow and encourages water to infiltrate into the soil.

The surface water flows that cause sheet erosion rarely flow for more than a few metres before concentrating into rills.

Rill erosion

Rills are shallow drainage lines less than 30cm deep. They develop when surface water concentrates in depressions or low points through paddocks and erodes the soil.

Rill erosion is common in bare agricultural land, particularly overgrazed land, and in freshly cultivated soil where the soil structure has been loosened. The rills can usually be removed with farm machinery.

Rill erosion can be reduced by reducing the volume and speed of surface water with grassed waterways and filter strips, ripped mulch lines, and contour drains.

Rill erosion is often described as the intermediate stage between sheet erosion and gully erosion.

Gully erosion

Gullies are channels deeper than 30cm that cannot be removed by normal cultivation. They can be spectacular to look at but over time actually lose less soil than sheet and rill erosion. Gullies occur when smaller water flows concentrate and cut a channel through the soil. Most gullies extend

upslope as a result of the head of the gully being continually undercut and collapsing. However, collapse and slumping of sidewalls usually contribute a greater proportion of soil loss. For more information, see *Fact sheet 5: Gully erosion*.

Tunnel erosion

Tunnel erosion occurs when surface water moves into and through dispersive subsoils. Dispersive soils are poorly structured so they erode easily when wet.

The tunnel starts when surface water moves into the soil along cracks or channels or through rabbit burrows and old tree root cavities. Dispersive clays are the first to be removed by the water flow.

As the space enlarges, more water can pour in and further erode the soil. As the tunnel expands, parts of the tunnel roof collapse leading to potholes and gullies.

Indications of tunnel erosion include water seepage at the foot of a slope and fine sediment fans downhill of a tunnel outlet.

Remediation actions include breaking open existing tunnels, revegetation, and increasing soil organic matter. Extensive earthworks may be required.

Wind erosion

Wind erosion is the detachment and movement of soil particles by air moving at least 20km per hour.

Wind moves the soil in two ways, suspension and saltation. Suspension occurs when the wind lifts finer particles into the air leading to dust storms. Saltation occurs when the wind lifts larger particles off the ground for short distances, leading to sand-drifts.

Wind erosion tends to occur most in low rainfall areas when soil moisture content is at wilting point or below, but all drought-stricken soils are at risk. Often the only evidence of wind erosion is an atmospheric haze of dust comprising fine mineral and organic soil particles that contain most of the soil nutrients.

Actions to minimise wind erosion include improving soil structure so wind cannot lift the heavier soil aggregates; retaining vegetative cover to reduce wind speed at the ground surface; and planting windbreaks to reduce wind speed. Also, be ready for severe wind erosion seasons which tend to be the summers following dry autumns and winters.

Mass movement

Mass movement is the downward movement of soil and rock under the influence of gravity. It is most frequent on slopes above 25 degrees with little vegetation and annual rainfall over 900mm and often occurs after heavy storms when soil becomes waterlogged and heavy.

Mass movement is a major form of natural land degradation in some regions, including the NSW north coast due to its intense rainfall events.

Types of mass movement include soil creep, earth flow, slumps, landslips, landslides and avalanches.

Factors increasing mass movement include erosion or excavation undermining the foot of a slope, weight loads of buildings or embankments, and loss of stabilising roots through removal of vegetation.

Vegetation removal may also increase soil water levels and soil water pressure, reducing the cohesive strength of the soil. In clay soils with high shrink-swell capacity water enters the soil through cracks and then swells the subsoil, increasing its weight on the slope.

Early signs of mass movement include previous movement, bare soil ‘scars’ across slopes, and stock tracks causing cracks or minor terracing. Old or dormant landslips are characterised by long, uneven hummocky slopes and bent tree trunks on steep slopes.

Because gravity is the principal force in mass movement expert advice is needed to remedy affected land. Remediation actions include diverting water away from slip-prone areas, fencing off suspect areas, and revegetating with trees and perennial pastures.

More information

NSW DPI’s website has information on soil erosion at: http://www.agric.nsw.gov.au/reader/soil-erosion/.

To discuss your specific soil erosion issues, contact NSW DPI soils advisory officer Abigail Jenkins, Wollongbar, on 6626 1357 or abigail.jenkins@dpi.nsw.gov.au.

Northern Rivers CMA CATCHMENT MANAGEMENT AUTHORITY

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