

- Avoid (further) soil disturbance and removal of vegetation. Constructing tracks, roads, dams, cattle yards and so on will inevitably require removal of vegetation. Locate such infrastructure on more stable ground. Tracks should be located along ridges or at the base of slopes, not across the face of slopes.
- Avoid the temptation to create a dam in a slip prone area as collecting and holding water will only compound problems in the immediate area.

If you assess the site as having only low potential for erosion, and is therefore still suitable for grazing, then maintain good pasture coverage and don't over-stock.

In the case of stream-bank erosion, replace Willows and other exotic species with suitable locally native riparian species. Fence off the riparian zone to exclude stock access to the stream. Consult with your local Catchment Management Authority regarding financial and technical support for such works. Similarly, if you have invasive waterways weeds seek advice from your CMA or local Department of Primary Industries office for the best way to control them.

Apart from managing the problem area, re-establishing locally native vegetation at the site of your landslip or erosion will yield other benefits:

- **Improved farm productivity** – the planting of shrubs and trees will create a shelterbelt for stock grazing in adjacent paddocks (crops will also benefit from the shelterbelt); and,
- **Improved biodiversity** – vital habitat is created for local wildlife, particularly if the plant species chosen include a rich mix of locally native species.

If the site shows signs of developing tunnel erosion (that is, you have detected it early in the form of small holes and cracks appearing in the ground) then you may be able to repair and rehabilitate the site by:

- Improving drainage at the site and by diverting water away from the site before it enters the new tunnel;
- Deep ripping the forming tunnel in autumn to break it up;
- Cultivating the area and including deep-rooted pasture species in your seed mix.

Recognising erosion

Sheet and rill erosion

The signs to look for include the relatively even removal of surface soil, and a series of little channels or rills.



Wind erosion

When the lifting forces of the wind exceed the gravity and cohesion forces of the soil particles, wind erosion occurs. Excessive wind erosion can cause dust storms.



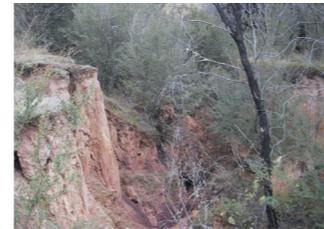
Eroding stream-bank

Signs to look for are slumping banks, cattle hoof prints, weeds such as blackberries (which outcompete stabilising native vegetation) and exotic trees such as Willows.



Gully erosion

Gullies may start off very small and over time, without management, grow in length, width and depth.



Tunnel erosion

Look for early signs such as small holes, cracks and gullies appearing in your paddocks. Here the tunnel is transforming into a gully, growing upwards to the head of the tunnel.



Recognising and identifying the early signs of erosion will enable you to manage the affected areas accordingly, mitigating long term issues.

What next?

For further assistance or advice on what funding may be available to help you implement your project, please contact the East Gippsland Landcare Network Inc. on (03) 5152 0600. If required, a visit to your property can be arranged. You can also visit www.egln.org.au for further information.

For severe landslip problems, contact a geotechnical expert who specialises in land and subsoil characteristics and rehabilitation.

The authors advise that the information presented in this brochure, including any management advice, has been prepared with all due diligence and care, and based on the best available knowledge and research.

Acknowledgements:

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Author: Mike Haughton, May, 2011

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Additional information: Department of Primary industries, 2009. *East Gippsland Soil Erosion Management Plan*. DPI, Bairnsdale, Victoria.

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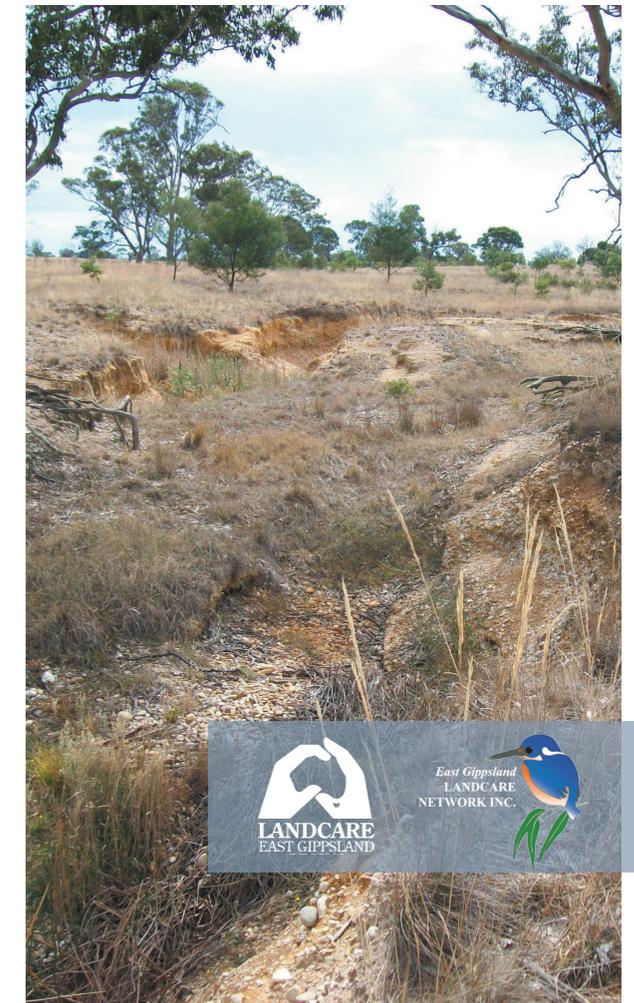
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Landslips and erosion

A guide for managing and preventing landslips and erosion on your farm.

One of a series of Practical Landcare guides



What are landslips and erosion?

Landslips are a mass movement of soil down a slope, and they may appear as a rather dramatic slump or as a gradual soil creep. Soil creep is less obvious and appears as terracing across the face of a slope (often mistaken for animal tracks). Landslips are not common in East Gippsland.

Erosion is the movement of soil by water, wind or gravity. In hilly areas of high rainfall such as here in Gippsland, it can take a number of forms and this guide focuses on:

- **Sheet and rill erosion**, which are often considered together. Sheet erosion is the removal of a thin layer of topsoil, and rill erosion is the removal of soil within small channels; both erosion types are caused by water movement.
- **Wind erosion** is the movement of soil by wind. Adverse environmental conditions (e.g. drought) and over-grazing by stock lead to a loss of protective vegetation cover, and increase the likelihood of wind erosion occurring.
- **Stream-bank erosion** (whilst a natural process which involves movement of sediments in a stream system), occurs where streams begin cutting deeper and wider channels as a consequence of increased peak flows or the removal of streamside vegetation.
- **Gully erosion** is the removal of soil along drainage lines by surface water runoff. Over time, and unless managed by the landowner, gullies will grow and their sides collapse.
- **Tunnel erosion** is the removal of sub-surface soil by the action of water, and its presence is often noted long after the process has commenced.

All of these forms of erosion are processes which involve the unwanted movement of soil. There are common causal factors, and therefore common management actions, for dealing with them after the event, as well as preventative measures to take before the event.



This paddock has been deep ripped to repair tunnel erosion damage.

The problem

Erosion impacts farm production due to:

- Loss of accessibility to farm vehicles.
- Loss of topsoil exposing infertile subsoil such as clay.
- Germination of weeds on disturbed soil.
- Loss of stock and crops.
- Loss of farm infrastructure such as fences and tracks.
- Sedimentation of dams.
- Loss of valuable nutrients.

Furthermore, there are adverse impacts on the natural environment. Erosion on the farm results in sedimentation in waterways downstream of the farm, adversely affecting water quality in streams and rivers which can all eventually drain into the Gippsland Lakes, estuaries, bays and ocean. Excessive sedimentation destabilises streams and can cause them to change course over time. Loss of aquatic habitat may occur, adversely affecting native fauna. Infrastructure such as bridges and pump stations may be damaged. Floods in urban and farmed areas may result. Some nutrients are also carried by soil particles, and excessive levels of phosphorus is a factor that causes algal blooms in waterways such as the Gippsland Lakes.

The cause

The loss of native vegetation with its soil-binding roots destabilises soil. Deep-rooted species have the ability to remove excess water, while foliage and leaf litter soften the impact of rainfall on the soil. Healthy soil with a high level of organic matter has better soil particle aggregation with which to withstand erosion. Specific causes of erosion include:

Landslips

The contributing factors are rainfall, geology, soil type and topography. Poor drainage, excess water and the loss of deep-rooted perennial vegetation create the conditions for a landslip to occur. Inappropriate human activity in slip-prone areas (such as the poor location of farm tracks and the clearing of vegetation) further increases the potential for a landslip to form.

Sheet and rill erosion

Areas that are particularly susceptible to sheet and rill erosion have loose soil lying on top of compacted or undisturbed subsoil. Sheet and rill erosion will typically occur during seedbed preparation, when soil is least protected.

Wind erosion

Overgrazing by livestock is a prime cause of wind erosion. Wildlife (such as kangaroos and wallabies) and feral animals (rabbits, goats, etc.) can also contribute to the grazing pressure. Lighter textured soils (commonly with a high proportion of fine sand) are more susceptible to wind erosion. Significant wind erosion occurs when heavy winds blow over these soil types, especially when they have been heavily grazed during periods of drought.

Stream-bank erosion

A number of factors have created the conditions for increased stream-bank erosion:

- Land clearing in catchments has increased the volume of water which enters streams.
- De-snagging and straightening streams has increased the velocity of water in streams.
- Clearing of streamside vegetation and allowing direct stock access to the stream has destabilised stream banks.
- Cultivating ground for crop production close to the banks of the stream destabilises the banks and removes the nutrient filtering effect offered by good coverage of streamside vegetation.
- Planting of exotic trees such as Willows has altered the structure of streams; e.g. fallen Willows continue to grow in streams and can create islands which then funnel flowing water hard against stream banks. Willows can colonise rapidly from broken twigs and can infest waterways.
- Waterway weeds can also force streams to alter their course resulting in loss of valuable farm land.

Gully erosion

Excessive un-moderated surface runoff can lead to gullies forming along cleared drainage lines, particularly when soil compaction by stock or vehicles or other disturbance of the topsoil leads to its poor absorption of excess water.

Tunnel erosion

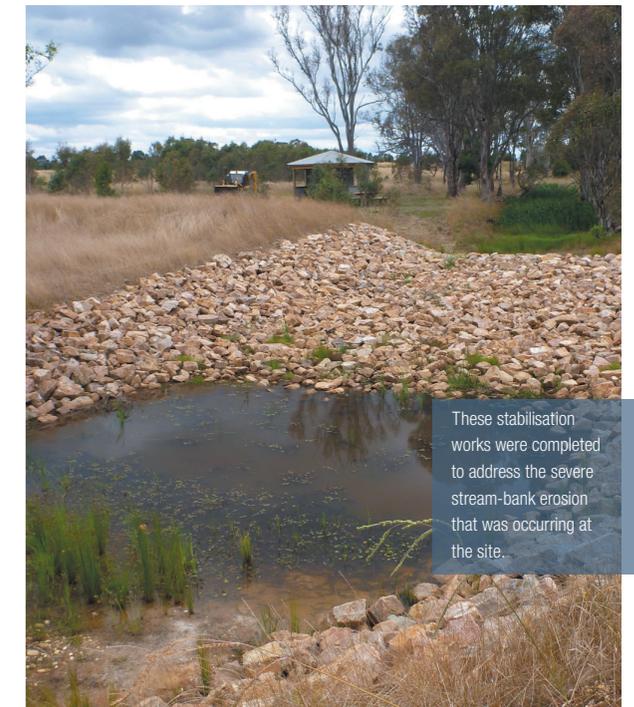
Tunnel erosion is particularly prone in areas where a shallow hard-setting topsoil sits over a subsoil which, whilst stable when dry, readily disperses when saturated. Native vegetation on such sites maintains ground stability. After land clearing, the amount of seepage and runoff increases. Tunnels then form when water flows along lines of least resistance such as in old tree stump holes, old tree root lines and rabbit warrens. Over time tunnels may become a series of open gullies, with all the problems associated with gully erosion.

Management and prevention

There are common management and preventative actions for dealing with erosion. These actions involve works which improve drainage and restore

vegetative cover, and can be used to deal with sites which have already slipped or eroded, and sites which show potential to slip or erode. Preventative measures should initially involve learning to recognise the potential for a landslip or erosion to occur by identifying slip-prone and erosion-prone areas in and adjacent to your farm. The factors which cause erosion are not constrained by property boundaries, so a collective approach from neighbouring landowners is encouraged.

- Drainage should be aimed at reducing the excess water content in the erosion site, and at preventing further build-up of water by diverting water away from the site to more stable ground (e.g. via diversion banks above the site).
- Locally native vegetation including deep-rooted perennial grasses, shrubs and trees should be re-established on and above the site to use up excess water. Stock should be permanently excluded from the planted area. Keeping stock out will preserve your new plantings and will prevent further damage to the unstable ground. See this as an opportunity to establish a shelterbelt for improved farm productivity or a woodlot for a source of firewood for your use. Local wildlife will see this site as a place of habitat and refuge, and a source of food.



These stabilisation works were completed to address the severe stream-bank erosion that was occurring at the site.