

Monitoring Erosion Rates and Trends

Landloch Pty Ltd can apply a range of techniques to assist sites in monitoring erosion rates or trends in erosion to achieve compliance with regulatory requirements.

Erosion monitoring can include:

- Determination of the stability of slopes or gullies;
- Quantifying off- and on-site impacts of runoff and sediment loads;
- Determination of erosion trends due to changes in site conditions and practices; and
- Development of appropriate erosion management guidelines based on actual data.

Erosion monitoring is often interpreted to mean erosion measurement, and there are certainly situations where the rate of on-site erosion or off-site movement of sediment is of primary concern. There are, however, situations where trends in erosion rates are just as (if not more) important than the actual rates involved. For example, knowing whether a gully is stabilising or becoming more active is often more important than the actual rate of erosion from the gully.

The scope of any erosion monitoring programme must be consistent with the Key Performance Indicators (KPIs) for the site. They may require measurements of average erosion, sediment concentrations in runoff or simply the absence of gullies. It must also be remembered that erosion typically varies enormously from year to year and erosion monitoring must consider climatic variability. Variations in annual rainfall erosivity are crucial when determining apparent success or failure in meeting erosion targets.

Erosion Measurement

There are several options available for measuring erosion rates. Landloch has expertise in the installation and operation of **erosion plots** used to trap and sample sediment and in measuring physical changes in eroding surfaces using **digital photogrammetry**.



Erosion plots can accurately and simply measure erosion rates from bounded plots up to 300 m² in area, and are not plagued by the large and unacceptable inaccuracies inherent in point based erosion measurements such as erosion pins. Erosion plots have been widely used for more than 15 years in Australia and south-east Asia. Landloch has installed plots in central Queensland, New South Wales and Papua New Guinea. The installations trap bedload sediment at their outlet and allow accurate sampling of suspended load that would move off-site. Regular

on-site maintenance is required. They are particularly useful where rainfall, runoff, and erosion occur relatively frequently, off-site water quality is an issue, and information on runoff rates is needed. Erosion plots are inappropriate in landscapes where gully erosion dominates, as the quantity of sediment moved in gullies is usually too large for typical installations to handle. In gully-dominated landscapes, Landloch's Geomorphic Gully Assessment System (GGAS) has been successful in determining whether gullies are stabilising or becoming an increasing problem.

Landloch uses **digital photogrammetry** to assess changes in surfaces of eroding areas. Paired photographs are used to generate a 3-D image of an eroding surface. Erosion or deposition rates are measured by comparing a time-series of 3-D images. Landloch's photogrammetry equipment can measure surface profiles with an error less than 1 mm. Digital photogrammetry is most suitable for lightly vegetated landscapes and where rill or gully erosion dominates. It is also used successfully to assess changes in gully volumes. Multiple paired photographs can be taken quickly to cover entire slopes.



Erosion Trends



Landloch can use erosion indicators to measure trends in erosion rather than actual erosion rates. **Landscape Function Analysis (LFA)** contains soil stability indicators that have a direct affect on erosion rate. Effectively, the LFA stability indicator considers the erodibility of the surface, and enables temporal trends in erodibility to be assessed and compared with erodibility of natural surfaces on analogue sites.

Landloch has developed the **Geomorphic Gully Assessment System (GGAS)** as a method to assess a range of gully attributes shown by geomorphic research to indicate either active erosion or stabilisation of gullies. GGAS also considers causes of gullying, and potential for gully activity to be increased.

Staff Skills and Experience

Landloch staff have installed and monitored erosion/runoff plots at various locations in central Queensland, New South Wales and Papua New Guinea. **Cam Vacher** has supervised a range of erosion monitoring studies at numerous locations in Western Australia and Queensland, including mine sites, construction sites, and disturbed rangelands. He has extensive experience with material characterisation and the potential impacts of changes in material properties through time. **Dr Rob Loch** has been involved in erosion and rehabilitation research projects in agriculture, forestry, mining, and civil construction for more than 30 years, and has extensive experience in planning erosion measurement and interpretation of the results obtained.

To develop an erosion monitoring programme tailored to your site and its regulatory requirements, contact:

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