Fact Sheet

Turf Queensland
Grow Green

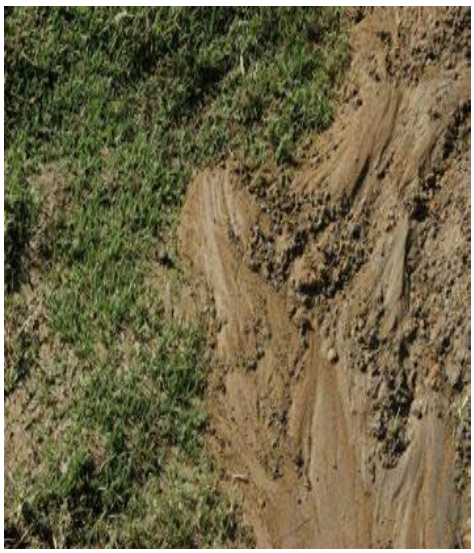
2019 - 01

Using Turf for Erosion and Sediment Control

Turf grass is an effective and natural measure for controlling erosion and sediment.
The use of vegetative ground cover is well established as the most effective long-term protection measure against erosion on disturbed soil. Turf grass is capable of reducing erosion by protecting the ground from the impact of rainfall. It also reduces the speed of runoff water, holds soil and sediment particles in place and enhances the ground's ability to absorb water.

A recent Australian study confirmed that turf should be considered as a part of any erosion and sediment control plan. This document summarises that research and highlights a number of additional considerations, including:

- The use of turf for erosion and sediment control
- Where and when to use turf grass
- Turf installation
- Turf maintenance



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Independent research indicates that when turf is planted to resist erosion, it only requires a maximum of seven days to bond to the underlying soil. Results suggest that establishment time varies slightly with season, but it is important to note the distinction between initial establishment and long-term function. Once fully rooted into the underlying soil, all turf grass species are likely to be highly effective in resisting detachment or tunnel development. If turf is being planted during highly erosive times of the year, the species with the most rapid root growth are preferable.

As a construction site evolves, subsequent site rehabilitation by turfing steep and erosion-prone banks is valuable in reducing overall erosion potential of the work site. Turf is also effective in stabilising areas of concentrated flow such as channels and drains, provided the flow velocities do not exceed 1.5 m/s. Turf grass can be used to control erosion on batters of relatively high gradient, though it is unlikely that growth would remain adequate over the long-term if batter gradients are greater than 33.3 per cent.

Sediment Control

Turf can be highly effective in trapping sediment, although there is a risk that if hillslope erosion rates are quite high the turf could be flooded by deposited sediment. For example, if a consolidated loam soil produced 26 t/ha of sediment, then that would deliver approximately 130 kg of sediment per metre width of slope. Assuming 70% of that sediment deposited had a bulk density of 1.2 g/cc, deposited sediment volume would be 76 litres, giving a depth of 76 mm over a 1 m wide strip, or 38 mm depth over a 2m wide strip.

It was generally observed that sediment deposited to a depth slightly less than the full height of the turf, so that turf 75 mm high would retain a deposited layer of sediment approximately 65 mm deep. However, there would also be a significant volume of space in the deposited layer taken up by grass stems, further reducing the total quantity of deposited sediment that could be stored per unit area of turf. Consequently, in the example considered above, a 2 metre-wide strip of grass would be expected to be completely flooded.

It is clear that the use of turf for primary trappings of large volumes of coarse sediment is more effective in situations where erosion rates are relatively low. However, turf may also be used in conjunction with other measures in areas experiencing higher rates of erosion. In sloping areas, sediment (silt) fences and various other products, such as coir logs and filter socks, are typically applied to impede and possibly filter overland flows. Highly visible, cross-slope structures are commonly used for soil conservation in Australia. Although their presence may be reassuring, they unfortunately do not provide much genuine erosion control. Reduction in flow velocity at a point will cause deposition of entrained sediment, but once past that point, flow will regain its previous velocity, or exceed it, if the particular structure has acted to further concentrate flow. As velocity increases, flow will rapidly regain its previous sediment load, as its detachment capacity is increased when sediment load is reduced. Consequently, barriers placed across the slope create a stop-start erosion pattern, and may have little impact on overall erosion rates.

Sediment fences do not filter sediment out of the flow. Once exposed to sediment-laden runoff, their pores tend to clog and their permeability reduces to relatively low levels. They act by ponding water, with deposition occurring in the backwater thus created, and large flows tend to flow over the top of the fences rather than flowing through. Unfortunately, such overtopping usually occurs at low points, and the resultant concentration of flow can be quite damaging to areas down-slope.

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Combined Approach

To overcome some of the problems inherent in sediment fences, and to obtain full benefit from the sediment trapping capacity of turf, a more effective approach is to:

a. identify a point at the toe of the work slope at which it is desirable to discharge runoff carrying considerably reduced sediment loads;
b. install a low (200 mm) sediment fence using a high porosity geofabric; and
c. install turf strips immediately down-stream of the sediment fence.

This approach ensures that the sediment fence causes deposition of coarser size fractions (possibly greater than 0.1 mm, and certainly greater than 0.2 mm). The turf strips would then be able to trap finer fractions of sediment that passed through or over the sediment fence, including some of the 0.02-0.05 mm fraction, without the turf becoming flooded with deposited sediment. Turf will not reduce turbidity of runoff flows, nor reduce the concentration of suspended sediment. But it can aid in greatly reducing the concentration of coarser particles, thereby reducing the maintenance costs of other runoff treatment options, such as sedimentation ponds.

Where and When to Use Natural Turf Grass

For erosion control, turf can be planted on batter slopes with a gradient of up to 33.3%. If planted in periods of peak risk for erosion, all species will perform well in summer, but preference should be given to species such as green couch or wintergreen for plantings in cooler months. In flow lines, reinforced turf will give greater stability in areas where velocities are likely to be greater than 1.5 m/s. For sediment control on hill slopes there are specific issues to be considered when using turf.
These include:

Placement

Turf strips should be installed on the contour at the toe of slopes with the potential to erode, to reduce sediment loads in runoff. Simulations of sediment trapping indicate that turf can trap sediment sizes of greater than 0.020 mm in diameter. Turf will not reduce turbidity of runoff, nor will it provide large reductions in the concentrations of particles that are less than 0.02 mm in diameter.

Strip Width

For greatest effectiveness of sediment trapping, areas producing higher runoff rates (including in Sydney, Brisbane and Townsville) will require strip widths of at least 2 metres, and preferably 3 metres. Winter rainfall areas, such as Melbourne, will require a minimum strip width of 1 metre, but 2 metres is preferable.

Species

The efficiency of sediment trapping will depend on effective surface roughness, which increases with grass height. Species can be selected for optimal sediment capture, such as buffalo which produces relatively tall swards, but other species can also be used if they are more accessible, affordable or better adapted to local conditions. Talk to your local turf producer for advice to find the right turf for your specific area and purposes.

Supporting Practices

For areas with comparatively high runoff and erosion rates, it is best to install a low, porous sediment fence on the up-slope edge of the turf strips. The aim of the fence is to trap the coarser particle sizes carried in runoff, so that there is a lower potential for the turf strip to be flooded by deposited sediment. For areas with winter rainfall and lower erosion potential, such as Melbourne, installation of an up-slope sediment fence does not appear to be essential.

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Impact of Soil Type

Although data on annual average erosion show considerable differences between soils in their potential rates of erosion, those differences are greatly reduced when 1:2 year erosion events are considered. Therefore, there appears to be little justification for altering strip width on the basis of soil type, except that areas of highly permeable sandy loam soils could have strip widths reduced by 1 metre from the optimal widths of 2 or 3 metres.

Installation

Appropriate turf management practices should always be followed for fast and healthy establishment. The factors that can influence turf installation will depend on the situation of the particular site. For example, the potential requirements and remedial measures for a turf installation at an urban construction site will differ markedly from a more extensive installation at a foreshore area, mine rehabilitation site or roadside installation. Despite this, some basic considerations for successful turf installation should always be considered.

Site Preparation

- Prior to installation, ensure that the underlying soil has at least the minimum physical and chemical characteristics to assist healthy turf growth. For example, wherever possible, ensure that the soil is prepared prior to installation by tilling and smoothing/shaping as required. Ensure that the soil pH and nutrient levels are adequate by testing soil and undertake any corrective measures as required.
- Ensure roots, sticks, rocks, waste and refuse are removed from the site.
- In some instances it may be desirable to spray out any existing weeds prior to turf installation. If this is the case, allow for a minimum of 10 to14 days prior to installation, as turf should not be laid on areas that have been recently treated with herbicide.
- Avoid compacting the underlying soil as much as possible as this could inhibit the establishment of the turf roots.

Laying

- Turf should preferably be laid on a layer of topsoil (minimum of 75 mm) which has been raked over to break any surface hardening (crust).
- Turf should be laid within 12 hours of delivery.
- Turf slabs or rolls should not be stretched or overlapped and can be cut with a knife or sharp blade.
- Ensure good contact between the turf and the soil to aid establishment and minimise any risk of ‘tunneling’ with water flowing underneath.
- If possible, a heavy turf roller should be used during installation.
- When it is laid, irrigate turf with 25 mm of water to encourage rapid establishment.

Maintenance

Good turf husbandry practices are essential for establishment and long-term performance of turf. Again, the site specifics and intended purpose of the turf area will, in conjunction with budget and accessibility, determine the maintenance practices that should be or can be applied. Generally, principles of turf maintenance include the points listed below.

- Mowing will depend on the area, the turf use and its purpose. In some cases mowing may not be required at all, sometimes it may fall under an existing maintenance regime and in some other instances it may require more focused attention.
- Newly turfed areas should not be mowed for 2 to 3 weeks while the turf is establishing. The first mow should not remove more than one third of the leaf blade length.
- Maintain length of grass at a minimum of 50 mm in areas subject to medium/high flows (higher than 1.5m/s) and from 20 mm to 50 mm in areas of lower flow.
- Maintain a healthy and vigorous turf sward by irrigating and fertilising where possible and practical.
- In areas of high traffic or high amenity value such as public areas, maintenance regimes may also require more intensive practices such as aeration or topdressing of turf on a semi-regular basis.

  The application of selective herbicides for weed control or insecticides for pest control may also be warranted in some installations once turf is established.

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