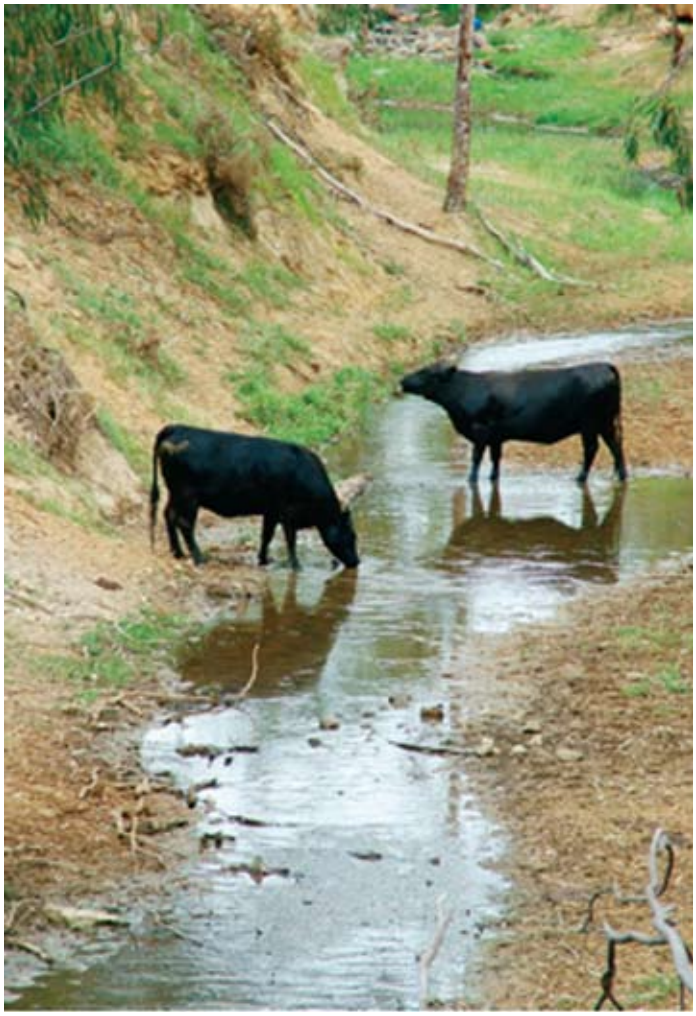
River Reflections
Melbourne Water River Health Grants Program Newsletter
Edition 3, October 2008

Erosion Processes in Waterways



Excluding stock from our waterways is a great way to prevent erosion

Erosion is a natural process, a key contributor in the making of soils and landscapes but is more commonly know for its negative effect on landscapes, watercourses and soil profiles.

This edition of River Reflections gives readers an insight into different types of erosion across the Port Phillip & Westernport Catchment and some examples of what can be done to minimise the effect of erosion on waterways.

Australian soils have a very shallow layer of topsoil (<1cm in many soils) compared to European countries (where up to 20m of topsoil can be present). Given this dramatic contrast in soil types it is not hard to imagine how the use of European farming styles on Australian soils may have contributed to erosion in Australia. Practices such as deep soil cultivation, land clearing and the use of hard hoofed grazing animals may have accelerated erosion in some areas. Waterways and drainage lines are the most common sites for erosion to occur and Melbourne Water is working with Landholders and community groups to help minimise the effect of erosion along Melbourne's waterways.

Prevention of erosion is the least costly way of controlling erosion and is regularly done by excluding stock and revegetating with trees, shrubs and grasses.

Editors Note

Welcome to the 3rd edition of River Reflections.

In the River Health team at Melbourne Water we often get requests for assistance with erosion on waterways or drainage lines. Through this issue we hope to share some of our knowledge about erosion with you and also describe Melbourne Water's approach to erosion control. We have a couple of success stories – see the two case studies – that have come out of our stream frontage management program and community grants funding to provide some further encouragement. I hope this answers question you may have, if you would like to make any comments please email us at riverreflections@melbournewater.com.au.

In this issue

- Common Types of erosion
- Natural river processes vs human induced erosion
- Some Success Stories
- Melbourne Waters role in treating erosion on waterways

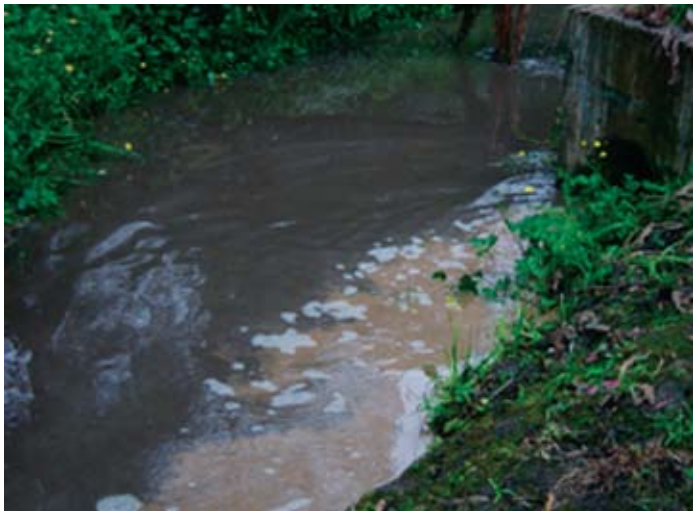
Common Types of Erosion

There are three common types of erosion that can occur on your property.

Sheet Erosion

Sheet erosion is the result of there being more rainfall than can soak into (or infiltrate) the soil. The excess water flows over the surface, carrying the soil with it.

It often results in large losses of top soil, rich in organic matter and therefore rapidly reduces the productivity of the land. Erosion may also result in removal of seeds or seedlings and reduce the soil's ability to store water for plants to draw upon between rainfall events. Soil deposited off-site through this type of erosion causes crop and pasture damage, water-quality deterioration and stream, dam, lake and reservoir sedimentation.



Erosion leading to sedimentation of a waterway

Sheet erosion it is difficult to recognise, often only identified when large amounts of soil are deposited along a fence line, and therefore often continues undetected whilst reducing land productivity and crop growth and jeopardising stream health and aquatic habitats. If undetected sheet erosion can continue into gully erosion resulting in loss of land and productivity.

Control

Good vegetation cover is important to reduce the risk of sheet erosion assisting to stabilise soils and increase organic matter. Organic matter works to maximise infiltration and soil structure, assisting with the transmission of surface water deeper into the soil. Minimising cultivation and land disturbance including compaction is important to assist the infiltration process.

Gully Erosion

Gully erosion occurs when water is channelled across unprotected land and washes away the soil along drainage lines. Gully erosion is responsible for removing vast amounts of soil, impacting farmland, roads and bridges and reducing water quality by increasing the sediment load in streams. Under natural conditions, run-off is moderated by vegetation which generally holds the soil together, protecting it from excessive run-off and direct rainfall.

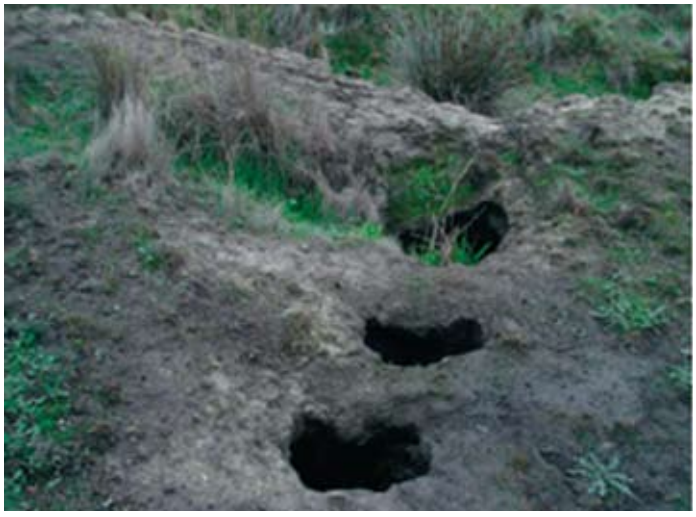
It may occur as an isolated event or over large areas, especially where there are soils with highly erodible subsoils (those made from dispersive clays).

Once established, gully erosion can be difficult to control. In most cases a combination of approaches, including the use of vegetation, fencing, diversion banks and engineering structures are required.

Tunnel Erosion

Tunnel erosion can start when surface water enters the soil through cracks, existing hollows or through wombat or rabbit holes. The erosion of dispersive clays in the subsurface can cause the formation of underground tunnels which can increase in size until the top soil layers are undermined and collapse, creating potholes and small gullies. The consequences of tunnel erosion can include sedimentation of waterways, loss and injury to livestock and reduction of accessibility and amenity of a property.

Tunnel erosion is common in uncleared bushland but it becomes more prevalent and dramatic on land that has been cleared of vegetation.



Erosion: the stories of our waterways

Rivers and creeks are dynamic environments that have developed through time. The natural process of erosion has played a large role in shaping our waterways. Rock and soil weathered in upper reaches of catchments were carried by water along our rivers and creeks to settle downstream and form floodplains in lower reaches. Meandering rivers changed their course in high flows, finding the easiest path towards the sea.

In recent times, erosion has become more widely known as a degrading process that threatens our riparian land, water quality and aquatic habitats. Further down the river system to the bays and oceans, sediments from our waterways can choke our marine ecosystems.

Since European settlement we have changed the landscape with dramatic impacts on our waterways. Rainfall that was once intercepted by vegetation and filtered slowly into our rivers and creeks now passes through at a faster rate. The expansion of hard surfaces such as roofs and roads in urban areas leads to an increase in storm water reaching our waterways. Altogether our creeks and rivers now receive more water than ever before. Erosion of creek beds and banks has occurred as a result of much larger volumes of water being carried by waterways.

The vulnerability of creek beds and banks to erosion is compounded by the removal of riparian vegetation. The deep roots of dense riparian vegetation provide the bank with the stability it needs to resist erosion, particularly in large flows. The removal of this vegetation for farming and development along waterways has opened up large areas to erosion, often with devastating impacts.

Three main processes contribute to the erosion of our streams:

Surface erosion:

Removal of vegetation and other protective ground cover such as logs has lead to the loosening of soil particles through exposure to weather. Trampling of soil by stock also leads to the movement of soil, eventually being carried into the waterway during rain.

Scouring:

Carried within the water flowing down a creek or river are particles of varying shape and size that can hit the side of the bank with force in high flows and floods. These particles, as well as the power of the water itself, can have the effect of wearing away the banks where they lack sufficient protection from vegetation.

Slumping:

When the stability of creek banks has been weakened, soils can be washed from underneath the surface. This is commonly known as ‘undercutting’ and is often seen along creeks under large single shrubs or trees. Slumping of the bank occurs when the area that has been undermined can no longer be held up and collapses towards the bank.

CASE STUDY

Westernport Bay – the impact of erosion across a catchment

Before: Gully erosion along Cardinia Creek (SRWS, 1987)

After: major engineering to control erosion (SRWS, 1987)

The draining of the Kooweerup Swamp is one of the biggest drainage projects undertaken in Australia's history. Once covering 40,000 hectares bound by Cranbourne to the west, Heath Hill to the east and the Dandenong Ranges to the north, the dense paperbark swamps were a rich hunting ground for local aborigines, despite being home to a man-eating bunyip, Too-roo-dun.

From the early 1830's, the Gippsland area was promoted to new settlers as an area of opportunity for agriculture. The Kooweerup Swamp was a barrier for development in the south-east, including railways to South Gippsland. A complex series of channels were constructed through the swamp, completing drainage of the area by the late 1800's. Bullock teams cleared swathes of paperbark for farmland.

Despite the successes of this major engineering feat, there have been massive losses for the Westernport environment. The loss of the filtering function of the swamps, combined with clearing of the upper catchment areas around Beaconsfield, Pakenham, Bunyip and Lang Lang, lead to increases in river flows through the region. Most of the waterways in the region suffered massive erosion.

As waterways eroded, around six million cubic metres of silt were washed into Westernport Bay, with devastating impacts on its ecology. Between 1970 and 1983, it is estimated that around 70% of the seagrass meadows of the bay were lost. Studies conducted by the EPA in the 1970's estimated that around 60% of sediments reaching Westernport Bay were from in-stream erosion.

Predecessors of Melbourne Water, the State Rivers and Water Supply Commission and local water boards such as the Dandenong Valley Authority, undertook major engineering works to control erosion. Features such as drop structures were built to control flood flows, and extensive revegetation efforts helped to restore riparian areas and stabilise soils.

Despite the impacts of the past, Westernport Bay is a natural haven. It still provides foraging and nesting sites for around 15,000 migratory birds each year and is recognised as a Wetland of International Importance through the RAMSAR convention. Melbourne Water continues the important work of its predecessors, spending around $18 million in the next five years on vegetation management, erosion control, protecting aquatic habitat, supporting local government, community and landholder conservation efforts and conducting research to inform future projects.

How can we control or prevent erosion?

Many erosion issues on waterways require large scale engineering solutions that are beyond the capabilities of landowners, residents and community groups. Melbourne Water spends many millions of dollars each year on erosion control measures and large scale revegetation projects, coordinated by its River Health team of engineers, geomorphologists and ecologists. These works are often carried out in partnership with councils, community groups and landowners.

The most significant way that communities can act to prevent erosion is through revegetation activities and restricting stock and detrimental pedestrian access to waterways. Melbourne Water supports community efforts in this work through its River Health Incentives Program. For information on the incentives that are available, including the Stream Frontage Management Program and Community Grants Program, call 9235 2231.

CASE STUDY 1

Friends of Walmer Street Bushland

The Friends of Walmer Street Bushland began as a local 'walking' group evolving into a Friends Group in 1997. The reserve had developed a couple of gully erosion heads due to the runoff of stormwater from the surrounding streets. As there is only one stormwater drain collection point approximately 400m away from the reserve, the amount of surface water runoff was excessive when it rained, causing gullies to form.

In 2006/2007 the group applied for funding through the Melbourne Water Community Grants program to address the gully erosion issue. Part of the funding allocation was for 30 CoirLog™.

CoirLog™ is a roll of coir, organic coconut fibre enclosed in a robust coir mesh. CoirLog™ provides erosion and wave control structures in riparian zones, and sediment capture in drainage lines and swales. CoirLog™ provides protection by decreasing the water velocity as it travels down the gullies, while vegetation establishes and takes over the long-term stabilisation.

The CoirLog™ were installed using hardwood stakes to secure them in place. Each log was placed across the gully as seen in the photo above. They were then planted into with a mixture of grasses and shrubs. A couple of years down the track the vegetation is establishing well and the gully erosion mitigation with the use of CoirLog™ is proving to be successful.

CASE STUDY 2

The Parwan Valley, Yaloak Estate

Yaloak Estate is a 14,000 acre sheep grazing and cropping farm located south west of Bacchus Marsh in the Parwan Valley. Historic erosion is well documented in the area due to its steep nature and lack of vegetation cover. John Sheehan, manager of Yaloak Estate, has been involved in Melbourne Water's Stream Frontage Management Program for two years. Yaloak Estate has used funding from the SFMP to exclude stock from accessing the Parwan Creek through fencing and John has also planted more than 11,000 indigenous plants. Excluding stock access is allowing revegetation and natural regeneration to occur and is designed to slow erosion caused by high flows. Protecting an area like the Parwan Valley from erosion is not an easy task and Yaloak's management plan involves stock exclusion and revegetation on a large scale.

How Does Melbourne Water Deal with Erosion

Melbourne Water is responsible for undertaking works to control erosion that occurs in the bed and banks of a waterway. Although historically there has been use of physical structures, such as rock and concrete, to control erosion, techniques have now moved away from using these 'hard' approaches, and have moved towards a 'soft' approach, using vegetation to naturally stabilise the banks.

It is important to realise some erosion will occur naturally in a waterway – not all erosion needs to be controlled, as it is a natural process in the landscape. It is only when it is occurring unnaturally fast, or is threatening infrastructure, that it will need action to be taken to prevent further issues. Before works commence Melbourne Water would look at the existing flora and fauna at the site. For example if there are high value native trees on or around the site, then any work to be undertaken would be designed to minimise the impact on these trees.

As a general rule, Melbourne Water now tries to use vegetation as much as possible to increase bank strength. Trees, shrubs, and native grasses, which are all generally deep rooted, are good to use in plantings to bind and stabilise banks. This is generally preferable to using hard structures, and has a much better impact for both the waterway and for native fauna.

However, in some cases it is not possible to control erosion with vegetation because the erosion is occurring too fast to allow vegetation to become established. In this case, a physical structure will be used. A small scale project might involve placing a small amount of loose rock to protect the area and prevent further erosion. For larger scale projects works will be designed to minimise the impact on the environment, and where possible the use of rock reduced. In most cases this will be followed by a revegetation program to further increase the strength of the bank in the long term.

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