

# Erosion management guideline



Managing erosion in waterways

# Introduction

This information sheet provides practical information to guide landholders in understanding waterway<sup>1</sup> erosion processes and issues, and to assist with identifying methods for small scale works to control waterway bed and bank erosion. Waterway erosion is a natural process, and it is not possible to stop it completely. Land clearing and development has accelerated waterway erosion, and left unmanaged it can threaten the health of the waterways and the ecosystems that depend on them

This information sheet is presented in two parts:

- Part 1 provides a summary of common types of waterway bed and bank erosion, how to identify them and what causes them.
- Part 2 provides advice on how to manage the erosion, including developing a strategy and choosing the right management solution for your situation.

Undertaking works within a waterway may require a Water Affecting Activity (WAA) permit issued by Green Adelaide. In the case of erosion control works, activities that involve depositing any solid material in a waterway or excavation of rock or soil from the bed and banks will require a WAA permit and you must first discuss your works with Green Adelaide prior to commencement of any activity. There are penalties that may apply if you don't have the necessary permit.

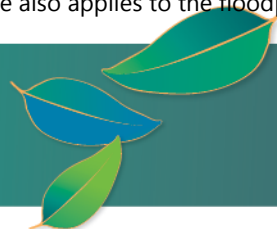
## Part 1: Understanding waterway erosion

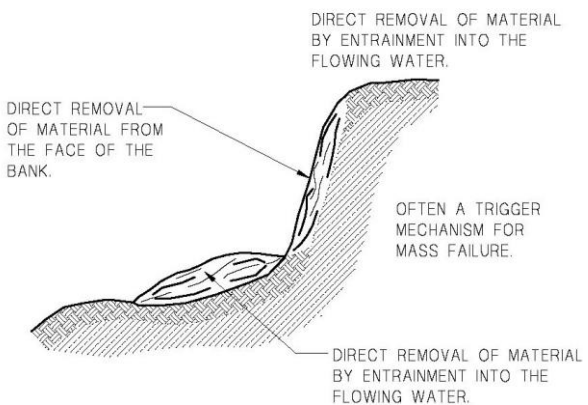
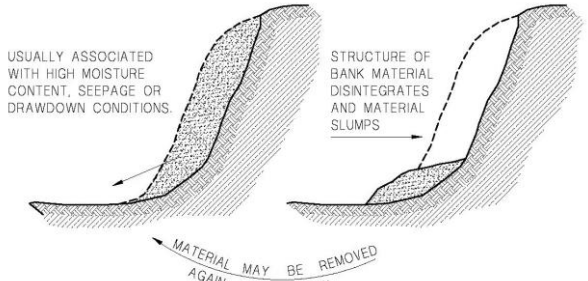
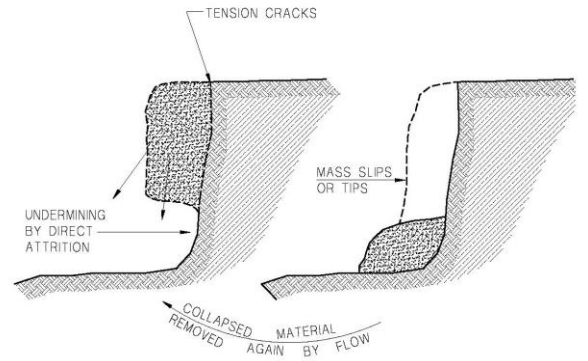

Waterway erosion can be divided into two broad categories as summarised in the table below.

Category	Causes
<i>Bed deepening</i> – a common process that erodes the waterway bed and destabilises the adjacent banks. Once initiated, bed deepening can continue and migrate upstream until it reaches solid and stable bedrock.	<ul style="list-style-type: none"><li>• Increase in water flow from adjacent development runoff.</li><li>• Increased bed slope due to human-made or natural processes.</li><li>• Increased erosion of bed sediments due to removal of a downstream water storage or natural blockage.</li><li>• Reduced supply of sediment to the bed from upstream sources.</li></ul>
<i>Bank erosion</i> - a natural process, that can be greatly accelerated by human activities. An unstable, eroding bank can be steep sided (greater than 30°) and exhibit constant sloughing of soil. It can result from bed deepening or through abrasive water flow.	<ul style="list-style-type: none"><li>• Loss of waterway vegetation.</li><li>• Rapid rise in water level placing additional load on banks.</li><li>• Groundwater flowing through the stream banks.</li><li>• Obstruction to flow causing turbulence along the bank.</li><li>• Large flow events.</li><li>• Bed deepening, or filling with sediment.</li><li>• Natural adjustment of the waterway (e.g. ongoing movement of meanders).</li></ul>

Understanding the type and cause of bed and bank erosion in your waterway is critical to developing an appropriate erosion control solution that is effective in the long term. The types of bed and bank erosion you're likely to encounter are summarised below.

<sup>1</sup> In this guideline the term 'waterway' includes creeks, rivers, lakes, springs, wetlands, on-stream dams, estuaries and other natural watercourses, whether modified or not. The procedure also applies to the floodplains of these waterways.



Type of erosion (in cross section)	Indicators	Cause
<p><b>Bank scour</b></p>  <p>DIRECT REMOVAL OF MATERIAL FROM THE FACE OF THE BANK.</p> <p>DIRECT REMOVAL OF MATERIAL BY ENTRAINMENT INTO THE FLOWING WATER.</p> <p>OFTEN A TRIGGER MECHANISM FOR MASS FAILURE.</p> <p>DIRECT REMOVAL OF MATERIAL BY ENTRAINMENT INTO THE FLOWING WATER.</p>	<p>Deep, narrow furrows down bank; steep sided bank slope with "fresh" soil visible and little to no vegetation.</p>	<p>High velocity flow; poor vegetation cover; excessive reed growth in bed; turbulence from debris in the channel.</p>
<p><b>Bank slumping</b></p>  <p>USUALLY ASSOCIATED WITH HIGH MOISTURE CONTENT, SEEPAGE OR DRAWDOWN CONDITIONS.</p> <p>STRUCTURE OF BANK MATERIAL DISINTEGRATES AND MATERIAL SLUMPS</p> <p>MATERIAL MAY BE REMOVED AGAIN BY FLOW</p>	<p>Tension cracks near top of bank and running parallel to bank; mass movement downwards of soil in blocks that may retain their shape and vegetation over metres to tens of metres; stepped down appearance of bank.</p>	<p>Removal of trees from top of bank; bed deepening; rapid lowering of water level; excessive loads at top of bank.</p>
<p><b>Bank undercutting</b></p>  <p>TENSION CRACKS</p> <p>UNDERMINING BY DIRECT ATTRITION</p> <p>MASS SLIPS OR TIPS</p> <p>COLLAPSED MATERIAL REMOVED AGAIN BY FLOW</p>	<p>Creation of overhanging top of bank, with undercutting at bottom of bank; tension cracks near top of bank and running parallel to bank; collapsed bank material has largely washed away.</p>	<p>High velocity flows; exposure of a soft soil layer in the lower bank; removal of vegetation in lower bank and bed; lateral movement of the low flow channel.</p>
<p><b>Bed scour or head-cut</b></p> 	<p>Presence of a waterfall in the bed; bank erosion on both sides of the waterway; absence of sand and aquatic vegetation (reeds and rushes) along and around the waterway bed; bell-shaped scour hole in the bed, exposed foundations of structure (e.g. bridge piers).</p>	<p>Removal of vegetation from within the channel producing high flow velocities; increasing runoff into the waterway; exposure of weak/soft soils in the bed.</p>



## Part 2: Managing waterway erosion

Developing effective and long-term solutions to managing waterway erosion requires good observation, careful planning and sensitive instream works. The following activities will assist you in developing the best erosion management solution for your situation. Depending on the urgency of works, there is a lot that can be done before works begin.

### Observe and monitor your site

Observe waterway erosion and flows for as long as possible to improve your understanding of the processes occurring. This includes the waterway upstream and downstream of your site to identify features or causes that may be contributing to erosion.

### Develop an understanding of the erosion issue and the causes behind it

Understand the erosion processes happening at your site to better understand the causes, and identify the erosion control solutions available to you. This includes developing an understanding of the waterway flow processes and their influence on erosion.

### Develop a strategy appropriate for your site

Be clear about your objectives for erosion control. Erosion control works are commonly undertaken for the purpose of protecting infrastructure, land or the environment. The nature and value of the assets under threat from waterway erosion will in part determine what type and cost of erosion control works you're willing to consider.

Identify the type of erosion and its causes. Any erosion control works you undertake must consider the type and cause of erosion if you are to reduce the likelihood that it will not continue into the future. This includes looking beyond the erosion site for the cause of the erosion.

An effective strategy to control erosion in the long term will include the following steps.

1. Waterway bed stability.
  - Check for bed instabilities like erosion heads or overly steep and changing sections of stream bed.
  - Before considering any other works, you should address bed deepening.
2. Reduce waterway erosion potential ("stream power").
  - Vegetation reduces stream power, provides strength to bed and bank materials, and shields the bed and bank materials against scour.
  - Encourage the natural establishment of vegetation by fencing streams and excluding stock or accelerate establishment by planting native vegetation yourself.
  - Reduce runoff volume and water flow velocity by replanting cleared catchments or ensuring a good cover of vegetation is maintained.
3. Waterway bank stability.
  - Bank stabilisation works should only be undertaken once bed stability has been provided and efforts to reduce high stream power are implemented.

### Identify the right erosion control solution

Choosing the right solution to fix erosion in your waterway is vital to its long-term success. Even with the right solution in place, you should expect that natural erosion will continue and so you should be prepared to undertake maintenance works from time to time. Regular monitoring will help with the early identification of any maintenance requirements.



Having first identified the nature of waterway erosion and (where possible) addressed the cause of erosion, you're ready to identify the right solution to repair erosion in your waterway.

You must not proceed with any of these erosion control works without a Water Affecting Activity permit issued by Green Adelaide.

The permit process is designed to assist you in developing the best solution for your situation, and to safeguard against adverse outcomes for other waterway users and the environment. There are penalties that may apply if you don't have the necessary permit.

Erosion control solutions are identified in the following table against the types of erosion they are designed to manage. More information on each of these techniques is presented in the document "Manual for Small Scale Waterway Erosion Control Works", available on the Green Adelaide website [greenadelaide.sa.gov.au/discover/water-plans-permits](http://greenadelaide.sa.gov.au/discover/water-plans-permits)

Type of erosion	Erosion Control Technique											
	Revegetation *	rock chute	Log sill or weir	Hay Bale, Silt Fence, Concrete Bag Sediment Trap	Porous Weir Sediment Trap	rock and pile drop weir	bank battering	rock beaching	Erosion Control Matting	Alignment Training – Large Woody Debris	Alignment Training – Wire Fencing	Large Woody Bank Protection
Bank scour	✓						✓	✓	✓	✓	✓	✓
Bank slumping	✓						✓	✓	✓	✓	✓	✓
Bank undercutting	✓						✓	✓		✓	✓	✓
Bed scour or head-cut	✓	✓	✓	✓	✓	✓			✓			

\* To optimise your chance of success, revegetation should be a component of every erosion management program.

## Help and further information

Green Adelaide

[greenadelaide.sa.gov.au/discover/water-plans-permits](http://greenadelaide.sa.gov.au/discover/water-plans-permits)

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