



## What causes bank erosion?

Rivers and streams are products of their catchments. They are often referred to as dynamic systems which mean they are in a constant state of change.

The factors controlling river and stream formation are complex and interrelated. These factors include the amount and rate of supply of water and sediment into stream systems, catchment geology, and the type and extent of vegetation in the catchment. As these factors change over time, river systems respond by altering their shape, form and/or location. In stable streams the rate of these changes is generally slow and imperceptible.



Rivers are dynamic systems that change over time

### Stream banks erode for many reasons

Stream bank erosion is a natural process that over time has resulted in the formation of the productive floodplains and alluvial terraces common to the middle and lower reaches of many of Australia's river systems.

Paradoxically, even stable river systems have some eroding banks. However, the rate at which erosion is occurring in stable systems is generally much slower and of a smaller scale than that which occurs in unstable systems.

Events like flooding can trigger dramatic and sudden changes in rivers and streams. However, land use and stream management can also trigger erosion responses. The responses can be complex, often resulting in accelerated rates of erosion and sometimes affecting stability for decades. Over-clearing of catchment and stream bank vegetation, poorly managed sand and

gravel extraction, and stream straightening works are examples of management practices which result in accelerated rates of bank erosion.

Erosion can also be accelerated by factors such as:

- stream bed lowering or infill
- inundation of bank soils followed by rapid drops in flow after flooding
- saturation of banks from off-stream sources
- redirection and acceleration of flow around infrastructure, obstructions, debris or vegetation within the stream channel
- removal or disturbance of protective vegetation from stream banks as a result of trees falling from banks or through poorly managed stock grazing, clearing or fire
- bank soil characteristics such as poor drainage or seams of readily erodible material within the bank profile
- wave action generated by wind or boat wash;
- excessive or inappropriate sand and gravel extraction
- intense rainfall events (e.g. cyclones).

### Processes of stream bank erosion

The various mechanisms of stream bank erosion generally fall into two main groups, bank scour and mass failure. In many cases of bank instability both will be evident, often with either scour or mass failure being dominant.

Bank scour is the direct removal of bank materials by the physical action of flowing water and is often dominant in smaller streams and the upper reaches of larger streams and rivers.

Mass failure, which includes bank collapse and slumping, is where large chunks of bank material become unstable and topple into the stream or river in single events. Mass failure is often dominant in the lower reaches of large streams and often occurs in association with scouring of the lower banks.

By looking carefully at the processes operating at a site it may be possible to narrow down the probable causes of instability.



Correct diagnosis of the underlying causes of erosion problems is important if successful and cost-effective solutions are to be generated. Assistance with identifying the causes of bank erosion and advice on potential solutions is available from the Department of Natural Resources and Water.

## Bank scour

Bank scour is the direct removal of bank materials by the physical action of flowing water and the sediment that it carries.



### Undercutting of the bank toe is a sign of bank scour

As flow speed increases, the erosive power of flowing water also increases and scour may occur. Increases in flow speed can be the result of natural (e.g. from the previous page d, f and i) and/or human induced processes (e.g. a and e).

Undercutting of the bank toe is an obvious sign of scour processes.

Effective strategies for combating scour are generally aimed at reducing flow speed through revegetation and in some cases through strategic bank or channel works.

## Mass failure

Mass failure describes the various mechanisms of bank erosion that result in sections of the bank sliding or toppling into the stream. Mass failure is sometimes described as collapse or slumping.

Bare and near-vertical banks or areas of slumped bank materials are obvious signs of these processes. The causes of these types of failures are often difficult to determine but can include natural (e.g. b or f) and/or human factors (e.g. c, e, g or h).



### Slumping is a common type of mass failure

Collapse following undermining of the bank toe and slumping as a result of saturation after flooding are common examples of mass failure.

Effective strategies for combating slumping or bank collapse are generally aimed at stabilizing the bank toe and restoring bank vegetation.

## Further information

For more detailed information on how to control stream bank erosion, or for permits for undertaking works within a watercourse, contact your local office of the Department of Natural Resources and Water.

### See also in this series

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For further information phone 13 13 04