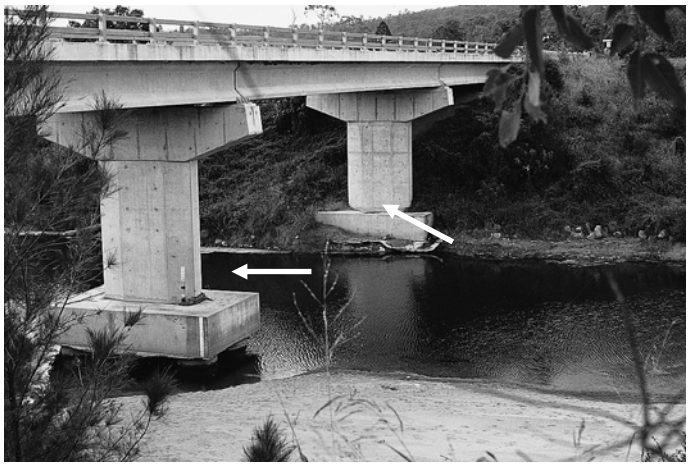
What causes streambed erosion?

What is bed erosion?

Bed erosion, degradation or lowering, is a process by which the bed of the stream is eroded to a new lower level at a much faster rate than occurs naturally.



These bridge abutments were originally built at bed level

Bed lowering can move in both an upstream direction (as a 'headcut' or 'nick point') and/or downstream, influencing channel stability over an extensive length of the river or stream system.

The problem with bed erosion

Bed lowering can initiate extensive bank erosion because the height of the banks relative to the bed are effectively increased, leaving them more susceptible to collapse.

Riverbed lowering can:

- undermine riverbanks, resulting in overall channel enlargement with all the associated adverse impacts of bank erosion on economic and environmental values
- cause lowering of river water level. This may deny water to pumps for irrigation and/or domestic supplies. It may also decrease habitat for in-stream fauna such as fish and platypus
- cause lowering of groundwater level in the adjacent floodplain. This may deny water to bore wells and adversely affect the aquifer
- cause downstream siltation, which can destroy aquatic habitats and have adverse impacts on water quality, water availability, flooding, navigation and recreational pursuits
- result in damage to infrastructure including bridges, crossings and pumps.

How does bed erosion occur?

There are four main processes that contribute to bed erosion:

- decrease in sediment supply. This can occur when the natural passage of sediment through the system is interrupted by upstream dams, weirs, catchment erosion control works, or excavations in the streambed
- increase in bed slope. This can be as a result of straightening the river, removing a bed control such as a rock bar, weir or crossing, or excavating the bed of the river for extractive industries, recreation or large pump holes
- increase in velocity (not associated with an increase in slope). This can be as a result of a channel constriction such as debris, fill, and vegetation on the riverbed or bridge abutments
- increase in discharge. This can be as a result of increased urban run-off, catchment clearing or increases in rainfall. It can also be from regulated water transfers for irrigation supplies.

A 'headcut' or 'nick point' can indicate active bed erosion

What activities can result in bed erosion?

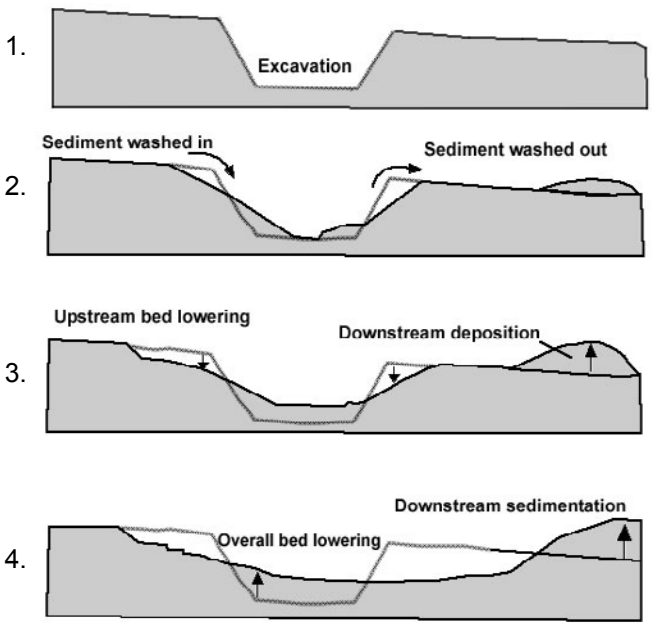
Human activities that alter the magnitude and/or frequency of stream flow can initiate bed lowering.

These include:

- clearing and development of a catchment
- diversion of water from one catchment into another
- prolonged flows delivering irrigation water
- lowered tail water levels for tributaries of regulated streams during floods
- concentration of flow within the channel due to the construction of levees, bridges and culverts.

Activities that directly alter a stream channel and that can initiate bed lowering include:

- channel straightening or shortening. Straightening or shortening a channel increases the slope of the bed. The channel adjusts to the new slope by eroding the stream bed and depositing sediment downstream
- excavation of drainage lines through on-creek swamps. This increases and concentrates the flow, thus creating greater flow energy. The greater flow energy is expended by eroding the stream bed, banks or both.



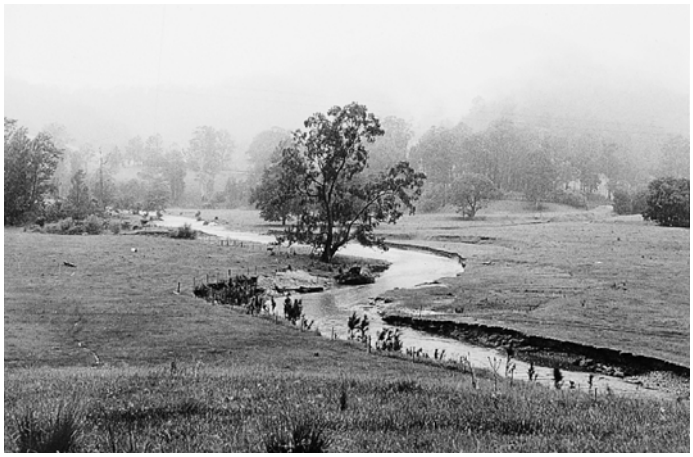
Excessive sand and gravel extraction can trigger bed lowering and subsequent bank erosion

- excessive extraction of sand and gravel. As the diagram above shows, excavating in the streambed (1) has a number of repercussions. Sediment is washed into the excavation causing the bed upstream to erode (2). Downstream of the excavation, the bed may be lowered as the flow picks up energy on leaving the hole (2, 3). Over time a new, lower bed level develops (4)
- excessive de-snagging and removal of vegetation from the channel. This increases and concentrates the flow, thus creating greater flow energy.

Symptoms of bed erosion

A number of features may indicate that bed erosion has occurred in the system, although none of the features are conclusive evidence by themselves:

- vertical headcuts
- steep or mobile riffles
- extensive bank erosion on both sides of the river
- headcuts on tributaries (hanging valleys)
- a change in channel width between disturbed and undisturbed reaches
- exposure of ancient logs and rock bars in the stream bed
- marks on bridge pylons of the old bed level
- wider, shallower reaches downstream of a headcut and fewer deep holes.



Bank erosion on both sides of the river may indicate bed erosion or lowering

Further information

For more detailed information on how to control stream bed erosion, or for permits for undertaking works within a watercourse, contact your local office of the Department of Environment and Resource Management.

See also in this series

R02 What causes bank erosion.

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For general enquiries contact the Queensland Government call centre 13 13 04 or visit www.derm.qld.gov.au

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