Section A3
Erosion type fact sheets
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Erosion type fact sheet # E1

BANK SCOUR (ATTRITION)

DESCRIPTION

Bank scour or attrition is the direct removal of material from the face or toe of the bank by entrainment into the stream flow.

INDICATORS

- Evidence of widening of the creek cross-section or lateral migration of creek meanders.
- Steepening of the creek banks.
- Removal of vegetation from the creek banks.

CAUSES

- High-velocity stream flows on the outside bank of creek meanders (bends). This can be made worse by clearing and/or urbanisation of the catchment.
- Obstructions in the creek channel such as fallen trees, dumped material and bridge piers, resulting in high stream flow velocities in contact with the creek bank.
- Lack of vegetation on the bank due to shading or direct removal by human activities.

SYMPTOMS

- Widening of the creek cross-section.
- Lateral migration of creek meanders.
- Choking of downstream reaches by sediment deposits.
Erosion type fact sheet # E2

BANK SLUMPING

DESCRIPTION

Bank slumping is the mass failure of the bank material because:

- the creek bed deepened at the toe of the bank, resulting in the bank becoming unstable and slumping into the creek under its own weight (or under some surcharge weight on the top of the bank) or
- high pore water pressure in the bank material was not balanced by adjacent hydrostatic pressures in the creek. The high pore water pressure weakens the structure of the bank material, causing it to slump into the creek.

INDICATORS

- Lateral movement or widening of the creek banks.
- Tension cracks in overbank material running parallel to top of the bank.
- Large clumps of vegetated bank slumped below the obvious original location of the vegetation.
- Significant groundwater seepage from the face of the creek bank.
- Near vertical, un-vegetated banks.

CAUSES

- High-velocity stream flows (often on the outside of creek bends) resulting in bed scour at the toe of the bank. This can be made worse by land/vegetation clearing and/or urbanisation of the catchment.
- Rapid draw down of stream flow following a prolonged period of bankfull flow resulting in saturation of the bank material. This is not common in urban creeks and is more prevalent in irrigation channels and large rivers.
- Lack of vegetation on the bank due to shading or direct removal by human activities.

SYMPTOMS

- Mass failure of the bank material.
- Lateral migration of creek meanders.
- Choking of downstream reaches by sediment deposits.
Erosion type fact sheet # E3

BANK UNDERCUTTING

DESCRIPTION

Removal of material from the base of the bank by direct attrition. This results in overhanging bank material developing tension cracks and falling into the creek. The fallen material might be gradually removed by the stream flow.

INDICATORS

- Lateral movement or widening of the creek banks.
- Discernible undercutting at toe of bank.
- Tension cracks in overbank material running parallel to the top of bank.
- Bank collapse on outside of creek bend with no evidence of:
  - groundwater seepage from the bank
  - saturation of the bank material
  - surcharge load on top of bank.

CAUSES

- High-velocity stream flows on the outside bank of creek meanders (bends). This can be made worse by clearing and/or urbanisation of the catchment.
- Obstructions in the creek channel such as fallen trees, dumped material and bridge piers, resulting in high stream flow velocities adjacent to the creek bank.
- Erosion-prone material at the base of the bank such as dispersive clays, soft silts and unconsolidated sands and gravels.
- Lack of vegetation on the bank due to shading or direct removal by human activities.

SYMPTOMS

- Mass failure of the bank material.
- Lateral migration of creek meanders.
- Choking of downstream reaches by sediment deposit.
Erosion type fact sheet # E4

**BED SCOUR (HEAD-CUT EROSION)**

**DESCRIPTION**
Deepening of the creek bed that propagates in an upstream direction. The deepening moves upstream by an advancing erosion head that can take the form of a small waterfall or steep section of the creek bed (head-cut). In some situations the location of the erosion head is not easily discernible to the casual observer.

**INDICATORS**
- Discernible waterfall.
- Steep section of creek bed at head of scour hole.
- Bell-shaped scour hole immediately downstream of erosion head.
- Exposure of foundations on structures such as bridge piers and culverts.
- Steep raw banks caused by lowering of the bed and the consequential collapse of the adjacent banks.

**CAUSES**
- Clearing and/or urbanisation of the catchment.
- Direct human modification to the creek such as channelisation, mining of in-stream gravel and sand, de-snagging works and unstable drop inlets upstream of culverts.

**SYMPTOMS**
- Choking of downstream reaches by sediment deposits.
- Severe bank erosion.
- Downstream flooding through loss of flood storage because of the concentration of stream flow within the incised creek channel.
Erosion type fact sheet # E5

FRETTLING

DESCRIPTION
The direct removal of erosion-prone material from the bank leading to a washing of a ‘scarf’ into the bank and potential collapse of the overhanging bank material. Usually formed by prolonged and constant water levels resulting in wave action lapping at a lens of erodible bank material.

INDICATORS
- Evidence of a washed out scarf in the face of the bank.
- Collapsed bank material above a washed out scarf.

CAUSES
- Wave action lapping against the bank.
- Erodible lenses of material in the face of the bank.
- High-velocity stream flows in contact with erodible lenses of bank material. This is exacerbated by clearing and/or urbanisation of the catchment as well as obstructions in the creek channel such as fallen trees, dumped material and bridge piers etc.
- Lack of vegetation on the bank due to shading or direct removal by human activities.

SYMPTOMS
- Mass failure of the bank material.
Erosion type fact sheet # E6

LATERAL BANK EROSION

DESCRIPTION
Erosion of the creek banks because of entry and exit of flows from the creek channel. Lateral bank erosion is most prevalent where storm runoff from adjacent land is concentrated within culverts, roadways and drainage easements before being discharged to the creek. The erosion is an upstream progressive erosion head that propagates laterally from the main creek channel.

INDICATORS
- Evidence of a culvert, roadway or drainage swale discharging concentrated storm runoff to the creek overbanks.
- Deep incised gullying propagating laterally from the main creek channel.

CAUSES
- Culverts, roadways, drainage swales etc. discharging concentrated stormwater runoff to the creek channel.
- Redirection of the creek channel because of urbanisation and/or clearing of overbanks (particularly on the inside of a meander).
- Erosion-prone material at the top of the bank such as dispersive clays, soft silts and unconsolidated sands and gravels.
- Lack of vegetation on the bank due to shading or direct removal by human activities.

SYMPTOMS
- Severe erosion of the creek bank with rapidly progressing erosion propagating laterally from the main channel of the creek.