



STREAM BANK EROSION REPAIR

What is stream bank erosion?

Removal of soil particles, or erosion, is a natural process along stream banks. It occurs via scour or by mass failure. Changes to drainage, removal of vegetation and addition of infrastructure can increase stream bank erosion.

Drainage management, stabilising the bank toe and restoring vegetation can help combat slumping.



Mass failure, or slumping, occurs when chunks of the bank slide or fall into the stream, often leaving near vertical banks.

Reducing speed of the flowing water with vegetation or strategic bank and channel works can help prevent scour.



Bank scour occurs due to the action of flowing water removing soil from stream banks. Bare or poorly vegetated areas are especially prone.

Introduction

These guidelines outline the steps involved when planning to repair sites affected by stream bank erosion. Stream bank erosion poses a serious risk to rural lands and can impact:

- **Productivity** by reducing the land available for production through stream relocation.
- **Asset and infrastructure integrity** (threatening roads, buildings, fences, yards and irrigation pipes) and land values.
- **Water quality** through increased sediment delivery to streams.
- **Safety** as drop-offs represent potential hazards to people, stock and equipment.
- **Biodiversity** as habitat values decline with the loss of soil, vegetation, shade and refuge areas.

Prevention is key

Stream bank erosion can be complex and expensive to fix and often requires specialist advice and government approval. It is far better to avoid the impacts on your property and prevent it from occurring in the first instance by following the points in the table below.

<input checked="" type="checkbox"/> Retain native vegetation	Keeping a structurally diverse plant community with groundcovers, shrubs and trees in suitable bank locations.
<input checked="" type="checkbox"/> Create a buffer zone	Do not farm to the edge of the bank. Establish a strip of permanent vegetation to act as a filter if land slopes toward the creek or to provide space for deep-rooted trees to anchor the top of the bank if land slopes away from the stream.
<input checked="" type="checkbox"/> Plan your drainage	Safely intercept and transfer overland flow to a resilient local drainage network. Address seepage and consider subsurface drainage.
<input checked="" type="checkbox"/> Manage stock access	Employ off-stream stock watering or control access to designated areas with reasonable bank protection. Avoid unrestricted access to riparian areas.
<input checked="" type="checkbox"/> Control exotic weeds	Non-native plants can outcompete native plants and affect the structural integrity of the vegetation community.
<input checked="" type="checkbox"/> Act early and seek advice	Identify, seek advice and act on potential problems early.



1. Define the problem

Understand the causes

To prevent accelerated erosion of stream banks an understanding of the causes and contributing forces is needed. The forces acting on a bank are influenced by:

- Rainfall intensity and duration.
- Soil moisture; affecting cohesion in the bank and timing of runoff.
- Catchment topography and geology and position in catchment.
- Stability of the stream bed and lower bank or “toe”.
- Vegetative cover, type and maturity over the catchment, floodplain and stream between the high banks.
- Stream size, slope and shape; including modifications such as levees.
- Erodibility of the stream material, its texture, structure and chemical composition.
- Characteristics of in-stream features such as bars and terraces.
- Localised flow behaviour including eddying and whirlpools.
- Flow restrictions such as dams, weirs, blocked culverts or stream confluences.
- Orientation of large obstacles including fallen trees and displaced rock.
- Overland flow drainage and subsurface drainage.
- Intensity of grazing pressure and the presence and condition of tracks and crossings.
- Disturbances including fire, non-selective herbicide application and clearing.



The depth, duration and velocity of flow as well as the erodibility of the bank and floodplain material will influence the severity of bank erosion.

All the above elements, and management strategies to address these elements, need to be considered in the development of any local stream bank restoration plans. Both upstream and downstream impacts need to be incorporated into any plans.

2. Design a solution

Stream bank repair is complex and expert advice should be sought. Stream condition and the scale of the problem influence an appropriate response. Consultation with neighbours and others, including local and state government departments, is part of the design process. Proposed works will dictate necessary approvals. Having a clear vision will help you share your strategy whilst remaining open-minded will allow you to improve your design.

All stream bank restoration options have a number of features in common:

- **Assessing impacts;** works may fail if bed lowering is occurring or upstream conditions change. Conversely, actions to stabilise a bank may have downstream effects and must be taken into account in the design.
- **Stabilising the toe** is critical to the structural integrity of the bank. Bank toe erosion during moderate stream flows will result in the widening of the stream. Combining techniques including careful selection, placement and anchoring of hard structures such as rock and timber in conjunction with vegetation establishment can be useful. Selective compaction of the soil can help resist soil movement whilst vegetation becomes established.
- **Stabilising and making shear banks safe**, typically by battering to a stable angle for the soil type.
- **Reinforcing the bank**, by establishing a complex structure of native vegetation including ground covers, shrubs and deep rooted trees to help bind the bank material to depth.
- **Dewatering the bank**, by intercepting drainage seeps and safely conducting overflow from buildings and washing facilities to stream bed level; and managing irrigation to reduce runoff.
- **Managing livestock access** using fencing, off stream watering points or designated stream access areas along with selectively grazing for short periods to maintain cover and allow regeneration of native seedlings.
- **Planning maintenance** of infrastructure affecting banks such as stream crossings, bank battering, track repairs to be conducted in predicted dry periods.

Identify the resources needed to implement your plan, including time, materials and machinery to complete the works as well as practices needed to maintain the restoration investment and ensure its integrity.



3. Implement the design

A comprehensive plan should detail all engineering works including specifications for toe stabilisation; battering; fencing; material needs; revegetation requirements; and any permit provisions. The plan should detail:

- Timing (considering weather forecasts and contingencies).
- Personnel (contractor availability; supervision, staff involvement).
- Machinery (size, type, features such as grab, compaction roller).
- Material availability (access, transport, on-site storage).
- Material classification (quantity and size distribution of rock, grade of geo-fabric, plant species and numbers for revegetation).
- Site Induction (safety, access, emergency procedures).
- Installation notes (layout of works, bank battering and fencing; placement and compaction requirements; geo-fabric installation if required; and vegetation planting and sowing plan).
- Hazards and potential impacts on existing infrastructure.
- Maintenance (needs, frequency, responsibilities and timing).
- Engagement (informing appropriate people).
- Authorisations (regulatory approvals, engineering signoffs if needed).
- Evaluation (assessing successful implementation).



Stabilising the toe and retaining existing mature vegetation on the bank as well regenerating vegetation in the early stages of establishment (foreground) can form part of your plan.

Be aware of any legal obligations such as installing levees (diversion drains), removing vegetation to allow works and cleaning-out and diverting dams. Check “Dial before you dig” (www.1100.com.au/) if earthworks are required and property boundaries, particularly where works abut block boundaries.

4. Evaluate and improve

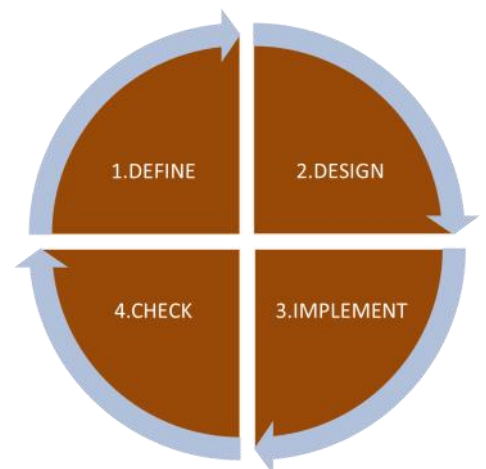
Like all farm investments, it is important to evaluate the performance of investments in stream bank restoration and to plan and schedule maintenance works into the future. Planning your evaluation and future maintenance needs is best undertaken during the initial planning process.

Evaluation has two main components:

- 1. Measurement of the implementation success:** have all works been undertaken in accordance with the plans? What worked well? What contingencies arose? What would I do differently if starting again?
- 2. Monitoring the integrity of the repair:** including the condition of the vegetation, percentage groundcover, robustness of fencing, bank stability and further deposition or erosion both up and downstream. Some stream migration is normal in many systems. In South East Queensland in-stream features such as bars and terraces between the high banks are reshaped by natural flows, especially during large flow events. In many instances changes can be anticipated and incorporated into restoration solutions.

Other things to consider:

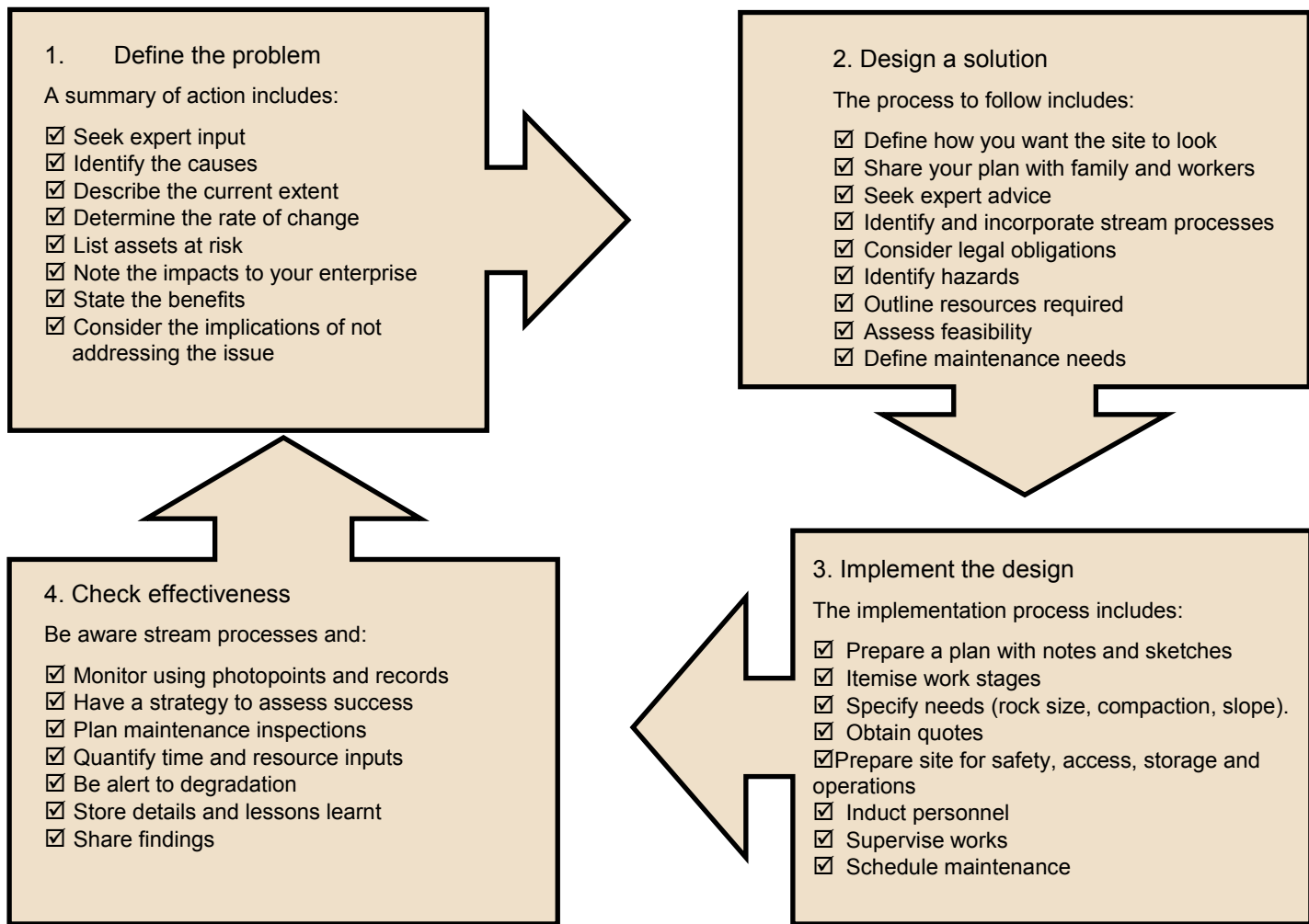
- Share findings and experiences with neighbours and professional groups: to add to the community’s capacity to manage stream bank erosion.
- Establish photo points and develop a photographic record. A photo point is a known position (post or picket placed near or in the project area) where similarly framed photos can be taken over time to monitor the progress of works and condition of a site.



A cycle of continual improvement can be used to assess your success and inform future works.



Stream bank erosion control checklist



Unstable stream banks will continue to be at risk if the toe continues to erode and they remain devoid of vegetation. Continued erosion will place productive lands, infrastructure and safety under threat. Farm values will potentially diminish. Water quality downstream will be affected by increased sediment movement downstream. With good planning and using best practices, investment in bank stabilisation can mitigate these risks.

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