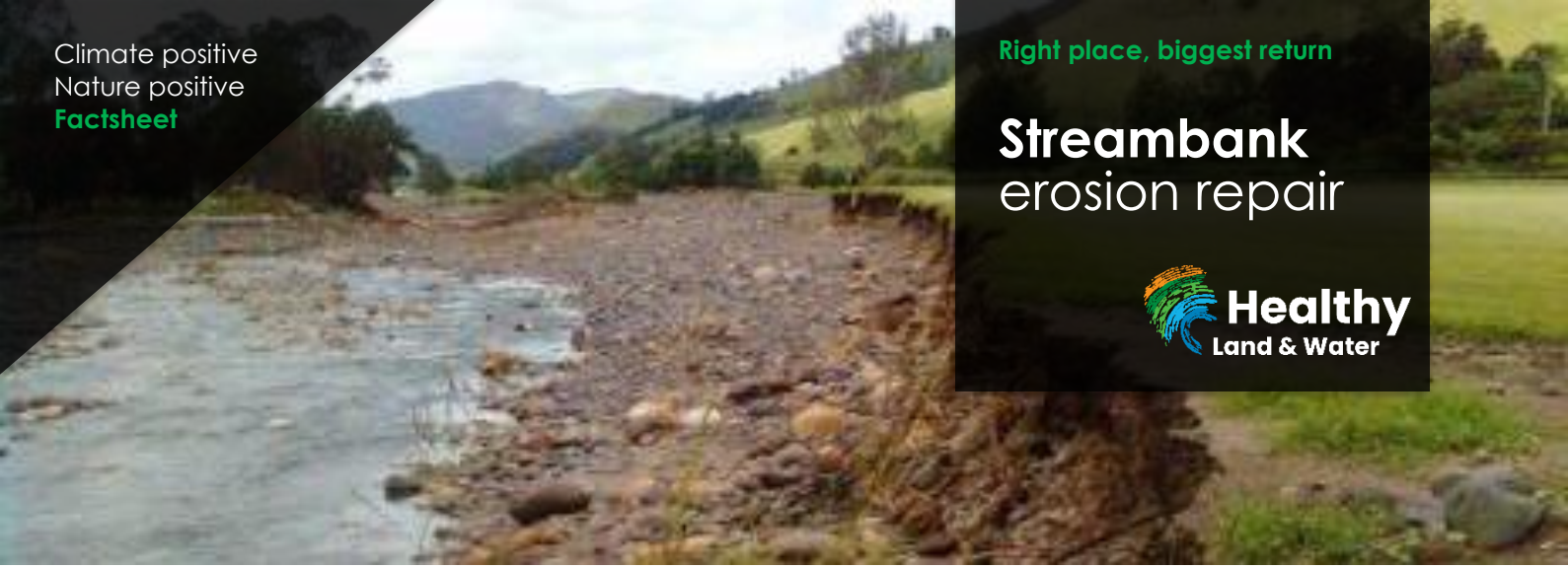

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Factsheet

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Streambank erosion repair

Healthy Land & Water

What is streambank erosion?

Removal of soil particles, or erosion, is a natural process along streambanks. It occurs via scour or by mass failure. Changes to drainage, removal of vegetation and addition of infrastructure can increase streambank erosion. Drainage management, stabilising the bank toe and restoring vegetation can help combat slumping. Reducing speed of the flowing water with vegetation or strategic bank and channel works can help prevent scour.

These guidelines outline the steps involved when planning to repair sites affected by streambank erosion. Streambank 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.

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

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

Prevention is key

Streambank 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:

Retain native vegetation	Keeping a structurally diverse plant community with groundcovers, shrubs and trees in suitable bank locations.
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.
Plan your drainage	Safely intercept and transfer overland flow to a resilient local drainage network. Address seepage and consider subsurface drainage.
Manage stock access	Employ off-stream stock watering or control access to designated areas with reasonable bank protection. Avoid unrestricted access to riparian areas.
Control exotic weeds	Non-native plants can outcompete native plants and affect the structural integrity of the vegetation community.
Act early and seek advice	Identify, seek advice and act on potential problems early.

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1. Define the problem

Understand the causes

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.

To prevent accelerated erosion of streambanks 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 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.

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

2. Design a solution

Streambank repair is complex and expert advice should by sought advice. 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 streambank 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 affects 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 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 resources to implement your plan

This includes time, materials and machinery to undertake the works as well as the changes in land use practice needed to maintain the restoration investment and ensure its integrity

Be aware of any legal obligations

This includes installing levees (diversion drains), banks and dams, removing vegetation to allow works and cleaning out and diverting dams. Check "Dial before you dig" (http://www.1100.com.au/).

3. Implement the design

A comprehensive restoration plan will help achieve the desired end result and inform contractors involved in works.

Detail all engineering works including specifications for toe stabilisation; battering; fencing; material requirements; and revegetation works; and any permit provisions.

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

Provide sufficient detail to allow quantity surveying and implementation by a competent contractor and include:

Timing	Considering expected weather and contingencies.
Personnel	Contractor availability; supervision and staff.
Machinery	Size, type, special 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 and risk assessment	Safety, access, emergency procedures.
Installation notes	Layout of diversions, rock works, battering and fencing: placement and compaction requirements; laying geo-fabric including keying in, pinning and overlapping; and vegetation planting and sowing.
Hazards and potential impacts	During works and on existing infrastructure.
Maintenance	Requirements and frequency; responsibilities and timing.
Engagement	Sharing the vision and providing appropriate people with information and copies.
Authorisations	Regulatory approvals, engineering signoffs if needed.
Evaluation	Assessing successful implementation.

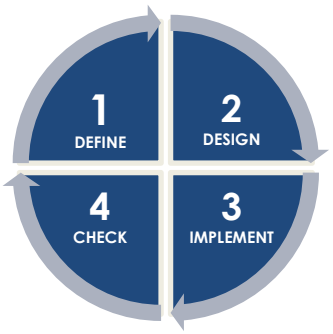
4. Evaluate and improve

Check your progress

Like all farm investments, it is important to evaluate the performance of investments in streambank 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:



A cycle of continual improvement can be used to assess and inform progress.

1. **Measurement of 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 and any emergent issues:** 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 streambank 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.

Streambank erosion repair planning checklist

Unstable streambanks 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.

1. DEFINE THE PROBLEM

A summary of action includes:

- ❒ Seek expert input
- ❒ Identify the causes
- ❒ Describe the current extent
- ❒ Determine the rate of change
- ❒ List assets at risk
- ❒ Note the impacts to your enterprise
- ❒ State the benefits
- ❒ Consider the implications of not addressing the issue

2. DESIGN A SOLUTION

The process to follow includes:

- ❒ Define how you want the site to look
- ❒ Share the plan with family and workers
- ❒ Seek expert advice
- ❒ Identify and incorporate stream processes
- ❒ Consider legal obligations
- ❒ Identify hazards
- ❒ Outline resources required
- ❒ Assess feasibility
- ❒ Define maintenance needs

1. IMPLEMENT THE DESIGN

The implementation process includes:

- ❒ Prepare a plan with notes and sketches
- ❒ Itemise work stages
- ❒ Specify needs (rock type, size, and shape, compaction, slope)
- ❒ Obtain quotes
- ❒ Prepare site for safety, access, storage and operations
- ❒ Induct personnel
- ❒ Supervise works
- ❒ Schedule maintenance

4. CHECK EFFECTIVENESS

Be aware of stream processes and:

- ❒ Monitor using photopoints and records
- ❒ Have a strategy to assess success
- ❒ Plan maintenance inspections
- ❒ Quantify time and resource inputs
- ❒ Be alert to degradation
- ❒ Share details and lessons learnt
- ❒ Capture learnings and share findings

Development of this fact sheet was supported and funded by:

Tim Fairfax Family Foundation

FRRR Foundation for Rural & Regional Renewal

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