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Case study

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Streambank erosion repair

Healthy land & water

Case study: Streambank erosion repair in the Lockyer Valley

This fact sheet highlights some options to stabilise streambanks that have been subject to erosion.

The examples provided are for relatively simple cases where upstream and downstream impacts from implementing the works have been assessed as negligible, the causes and extent of damage is local and the safety risks and assets under threat are confined to the adjacent areas on the property.

For a more complex example where impacts are broader please refer to *Erosion Factsheet 4 of 5 Streambank erosion repair: Laidley Creek case study*. For advice on how to plan streambank repair work please refer to *Factsheet – Erosion - Streambank erosion repair*.

Defining the problem

Streambank erosion can be broadly classed as either scour or mass failure. Sometimes these both occur in the one location.

Streambank scour can lead to stream widening and loss of riparian vegetation and other assets.

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 the right planning, investment in bank stabilisation can mitigate these risks.

In these four examples the near vertical streambanks are unstable and unable to support a diverse native vegetation community consisting of groundcovers, shrubs and deep-rooted trees.

A complex mix of low, medium and tall native plants provides the most strength to a streambank. The diverse root structure reinforces the bank through the tensile strength of the intertwined roots. Additionally, the vegetation acts to transpire moisture from the bank resulting in a more cohesive, and less erosion-prone, streambank.

***MT SYLVIA**: Scouring has occurred here resulting in a very unstable steep bank, impacting on the productive potential of the farm.*

***LOWER TENTHILL**: Mass failure has resulted in a bank slump in the above example. This poses a serious safety risk to farm traffic and workers.*

***THORNTON**: Both mass failure and erosion scour has occurred in the example above resulting in a loss of land and the need to relocate farm tracks and power infrastructure.*

***EAST HALDON**: Scour has caused the stream to widen and the low flow channel to change course. Land used for grazing has been lost along with fences. Infrastructure on the floodplain has suffered impact.*

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Designing a solution

In all four examples the key to achieving a long-term solution involves ensuring a stable toe that is resistant to erosion and establishing a mature mix of vegetation on the streambank.

A mature vegetation community will take ten or more years before it becomes most effective in helping to reduce the likelihood of unacceptable erosion, remembering that some soil movement is normal in a stream system.

The tolerable level of risk and threat to assets needs to be considered in the restoration design.

Where risks to cropping land and infrastructure are low it may be acceptable to conduct earthworks to create a stable batter in the dry season and sow a cover crop whilst planted native tubestock become established.

If irrigation is not available, sowing and planting can be conducted after rainfall or when it is anticipated.

In situations where assets such as irrigation lines, fences, yards, tracks or buildings are damaged or at greater risk, additional structures may need to be put in place to protect the streambank whilst vegetation matures.

Structures may include:

- Engineered large woody debris
- Groins
- Gabions
- Rock revetment or beaching
- Designed geofabric products, or
- Pile fields

Clockwise from top right:

Placing logs in the engineered structure; pinning the log structure to the bank; rock revetment along the bank toe; geofabric socks to stabilise the bank toe; pile fields in combination with rock revetment and placement of geofabric to allow time for vegetation establishment.

Case study design options

Common features in all streambank restoration projects include assessing impacts, stabilising the toe, making shear banks safe, reinforcing the bank using native vegetation, dewatering the bank, managing grazing and implementing a maintenance plan. These features need to be considered in the context of available resources including, funds, machinery, materials and labour.

MT SYLVIA: *A dam on the property had collected sediment and required maintenance and repairs to the dam wall. The landholder was able to spread some of this reclaimed soil over the reshaped bank to help establish vegetation. Turf from the farm provided instant cover whilst deep rooted native vegetation establishes. The bank was battered to a slope of 1 (vertical) to 3 (horizontal), before spreading topsoil and covering with a combination of native plants and turf.*

LOWER TENTHILL: *High density angular basalt rock was carefully placed at the toe of this slump using an excavator with a rock grab. The soil behind the rows of rock was compacted before the bank was battered and sown with a cover crop as native plants established. This example highlights the importance of a stable toe to maintain the integrity of the bank and the need for careful placement of the rock to make use of its angularity to interlock the structure.*

THORNTON: *Reinforcing mesh was bent into cubes and lined with geofabric before being filled with gravel to create improvised gabions. These cubes were stacked along the bank toe before the bank was battered and planted. This example demonstrates the innovative use of available materials to fabricate a structure with much greater resistance to erosion than soil material alone. The steel reinforced, geofabric lined, gravel filled gabions were carefully keyed into the reshaped bank to reduce the likelihood of outflanking. Structures such as these are designed to provide stability to the bank whilst vegetation becomes established as the long term solution to reducing streambank degradation.*

EAST HALDON: *This bank was reshaped before being covered with topsoil to improve conditions for plant establishment. Care was taken not to disturb the line of trees (refer front cover and to the right of the above images) that survived the flood event and retain them along the bank toe. This example illustrates the importance of incorporating existing riparian vegetation into the streambank restoration design and, where possible, including any local topsoil reserves to create a better environment for plant growth.*

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Implementing the design

The four cases presented in this study all required considerable planning input despite being relatively straight forward in terms of the cause of the streambank degradation issue. Simply treating the symptom is unlikely to be sustainable in the long term if the cause is not addressed.

Contractors and specific machinery were booked well in advance of start dates. Earthworks were timed to avoid the high probability of intense storms expected during our summer season. Labour inputs were planned around busy farm periods. Operators entering properties were inducted and informed of access arrangements, safety considerations and hazards, restoration design specifics and expectations.

Permit provisions, insurance details and payment arrangements were discussed and agreed prior to commencement of works. On site supervision during the installation process was critical to successful implementation of the plan according to the specifications.Once earthworks were completed, sites were protected from livestock and revegetation efforts commenced immediately.

Evaluate and improve

Once initial works were completed an assessment was made on the success of the restoration design and the maintenance regime commenced. Initial photopoint images were captured along with a documented appraisal of the success of the works. Routine inspections were scheduled and event-driven monitoring needs identified including who will conduct the inspection, critical aspects to observe and how these records will be reported and stored.

Issues considered as part of evaluation included:

- ❒ Were all elements of the plan delivered in accordance with the design?
- ❒ What modifications were made to the designs on site?
- ❒ Did unforeseen contingencies arise?
- ❒ Was the restoration plan delivered within budget?
- ❒ Would I change anything if starting again?
- ❒ Are there other similar issues that need to be addressed?
- ❒ Have sufficient resources been dedicated to maintenance?
- ❒ Is vegetation establishment on track and have
- ❒ Have I achieved the desired proportions of ground covers, shrubs and trees?
- ❒ Are fences adequate to manage stock access?
- ❒ How have the works handled subsequent flow events?
- ❒ Is the structural integrity of the works intact?
- ❒ Do any unplanned maintenance issues need to be addressed?
- ❒ Have I kept records and photographs in safe, retrievable storage?

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