

Waterway Technote

Managing erosion

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Benefits of managing erosion

Stream bank erosion can be a major source of sediment within a dairy system. Managing erosion will reduce the loss of productive land, reduce flooding effects downstream and reduce the effect of sediment on water quality.

Stream erosion is a natural process but will be accelerated by:

- The removal of stabilising vegetation from stream banks and catchments
- A channel blockage upstream that is redirecting water flow.



Photo courtesy of Waikato Regional Council

Mitigations for erosion control at a glance

Mitigation type	Benefits	Limitations
Exclude stock	Reduces pressure on banks, allows vegetation to establish.	Will not prevent erosion that has begun when done in isolation.
Fence back far enough to allow some movement of the stream	Reduces stock or equipment pressure on the bank, stabilises bank while vegetation establishes, prevents the need to move the fence.	Will not prevent bank collapse.
Low natives (sedges and rushes)	Reduces scouring, survives sediment and flooding over the top. Good for lower bank.	Will not prevent bank collapse.
Full range of natives	Excellent control of the bank with diverse root systems. Long term solution.	Will not prevent erosion on vertical banks greater than 1.5m high.
Poplars and willows (non-weedy varieties)	Fast growth, strong root system to lock the bank together.	Requires on-going maintenance and have a relatively short life span. Do not self-propagate.
Natives with poplars and willows	Long-term solution with fast stabilising effects from the poplars and willows.	Greater costs, increased planting rate and maintenance.
Erosion control structure	Long-term solution which provides armouring to the stream in areas of severe erosions or to protect infrastructure.	High cost involved, requires consent from regional council, may require assistance from an engineer, and makes it difficult to establish vegetation.

What can we do about erosion?

Severe erosion

Fence back far enough to allow for some movement of the stream, this will depend on the stream. Consider how far the stream moves during large storm or erosion events and how many events occur yearly. Vegetation will not protect the stream straight away so fence back far enough to allow for three years of erosion.

Plant appropriate species on the outside of bends to help anchor them against erosion. Tree species with deep and extensive root systems are the most appropriate in these situations. In most cases a diverse range of native plants will stabilise the bank, however in more severe cases poplar and willow species will be beneficial.

For erosion that is occurring quickly, Matsudana willow, shrub willow and/or poplars are the best option due to their fast growing nature. Plant native species such as ribbonwood, cabbage tree and lemonwood among the exotics, as they also have extensive root systems¹. A wider mix of other native plants can then be planted further back. For further information on how to plant native species see: *Waterway Technote: Planting*



An example of severe erosion.

Source: Basher, LR & Watson AJ, 2006: *Stream bank erosion: a review of process of bank failure, measurement and assessment techniques, and modelling approaches*. Landcare Research. Nelson. New Zealand.

¹ Phillips C, Marden M and Rowan D, 2001: Soil stabilising characteristics of native riparian vegetation in New Zealand. Paper presented to NZARM Conference 2001, Hamilton/ Landcare Research.

Where eroding banks are greater than 1.5m in height it is unlikely that planting native species alone will be enough to control the erosion. Other methods such as erosion control structures or planting erosion control exotic species will need to be considered.

See: *Waterway Technote: Planting* for guidance on planting erosion control trees and native species.

Note: Tall trees with small root systems such as pines are not appropriate as they can be easily undercut and lead to erosion.

Moderate erosion

Fence back far enough to allow for some movement of the stream, this will depend on the stream. Consider how far the stream moves during large storm or erosion events and how many events occur yearly. Vegetation will not protect the stream straight away so fence back far enough to allow for three years of erosion.

Plant appropriate species in the lower bank zone such as grasses, sedges, rushes and other dense groundcovers. These plants stabilise banks and will withstand flood flows.

For added erosion protection you can also plant deep rooting native species (e.g. ribbonwood, cabbage tree, lemonwood and lacebark) or poplar and willows several metres back from the grasses, sedges or rushes.



An example of moderate erosion.

Source: Environment Southland

For erosion that is occurring quickly Matsudana willow, shrub willow and/or poplars are the best option due to their fast growing nature. Plant native species such as ribbonwood, cabbage tree and lemonwood among the exotics, as they also have extensive root systems². A wider mix of other native plants can then be planted further back.

If erosion is occurring slowly native species such as ribbonwood, cabbage tree and lemonwood may be sufficient. For further information on how to plant native species see the planting section of the waterways technical series.

See: *Waterway Technote: Planting* for guidance on planting erosion control trees and native species.

In-stream blockages

Islands

Islands often form in streams in places where the water slows down and deposits its sediment load, such as inside bends. They can form a habitat for pest plants such as willow, and trap debris or divert water causing bank erosion. (See below for pest willow removal.)

When deciding what to do with the island you must contact your regional council. The island is a natural feature of the stream bed and removal may require resource consent.



² Phillips C, Marden M and Rowan D, 2001: Soil stabilising characteristics of native riparian vegetation in New Zealand. Paper presented to NZARM Conference 2001, Hamilton/ Landcare Research.

Debris pile

Leave large wooden debris in the stream as they make a good habitat for invertebrates. Check your regional council rules before removing any large items from the river. Major blockages that disturb the stream bed may require resource consent to remove.

Pest willows causing erosion

Pest species of willow (grey and crack willow) often grow in the bed of waterways causing blockages and erosion. Where this occurs only remove trees causing a problem and selectively prune the rest so they can be left to support the bank.

First: check if you need resource consent.

Resource consent may be required for any disturbance of the bed of a waterway so check with your regional council.

If you have more than a few trees that require removal, contact your regional council for advice as you may require resource consent and they also may assist with funding.



An excavator removing pest willow trees from a stream.

Source: Gibbs, 2007: Best Practice Guidelines for Vegetation Management and In Stream Works. Waikato Regional Council Technical Report 2007/41.

Cutting down trees

- Trees can be removed by cutting them off at the base and lifting them away from the waterway with an excavator.
- Cut trees as close to the ground as practical, but do not pull out stumps or remove stumps from the bed of waterways unless absolutely necessary.

Poisoning trees

- Without poisoning, willows will grow back after cutting. Ensure that stumps are treated with herbicide or the willow is poisoned before cutting.
- Poison stumps immediately after cutting – use Glyphosate (10 percent) with a penetrant and marker dye.
- If you are only removing a few trees you could also use vigilant gel herbicide.
- You must minimise the possibility of sediment entering the watercourse.
- Fell trees away from watercourses, use machine assistance where practical.
- Begin removal works at the upstream end and work downstream to reduce the impacts of sediment disturbance and catch floating debris in the downstream trees.
- Machinery should grab and lift slash, not pull or drag it. A digger with a “thumb” or grapple is advised.

Take care with the timing of works

- Undertake works during periods of dry weather and low flows.
- Works are best undertaken from December to April when the willow sap is flowing into the roots (senescence) because this will result in the best kill. However, also note that March and April are peak spawning times for Inanga in tidal streams and disruption breaches the Resource Management Act.
- Time works so that follow-up herbicide spraying can be undertaken before autumn leaf fall.

Make a plan to deal with debris

- Pile debris high as far away from the floodway as possible. If there is a risk that piles will be moved by a flood then they should be disposed of immediately or anchored in place.
- Burn willow logs as soon as possible following removal using diesel as an accelerant. Green trees will produce a lot of smoke and is likely to be a problem, so you may need to wait three to four months for the trees to dry out before burning. Check with your local authority regarding fire restrictions prior to burning.

Follow up with riparian fencing and planting with appropriate plant species.

Erosion control structures

If the erosion is severe and/or threatening core infrastructure, a more immediate erosion control solution may be required. Immediate solutions include hard structures such as rock and gabion baskets, flumes and detention dams.

This work will most likely require resource consent. Contact your regional council for information about what solution would be most appropriate and any consent requirements. In some cases regional councils may be able to assist in planning or funding some of the work.



An example of an erosion control structure (rock rip rap).

Source: Gibbs, 2007: Best Practice Guidelines for Vegetation Management and In Stream Works. Waikato Regional Council Technical Report 2007/41.

Further advice

Your regional council is the best place to start when seeking advice on waterway erosion, consenting advice and stream management.