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Clean Streams



● A Guide to Managing Waterways on Tasman - Marlborough Farms

Clean Streams

● A Guide to Managing Waterways on Tasman / Marlborough Farms

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Managed Waterway Margins: Why Are They A Winner?

Keeping ahead of the play

If looking after your farm business and your local environment is important to you, it could be time you considered managing your waterways. Well-managed waterway margins could help you meet market demands, enhance your farm and stock management, and protect water quality and freshwater life into the future.

There are many good examples in Tasman and Marlborough where profitable farming businesses have adopted good environmental management. Many of these farmers say that managing waterways has benefited their farm by:

- reducing stock losses
- reducing bank erosion
- conserving soil
- improving stock health
- improving the way the farm looks.

It's not always a big job

This booklet provides information about **how to manage waterways** to improve water quality, freshwater life and bank stability, as well as enhance your farm. There are several **different approaches you can take**, depending on budget, the type of waterways on your farm and your individual farm and environmental goals. It doesn't need to happen all in one year either – small changes over several years can add up to making a big difference to your local water quality in time.

What do we mean by waterways on farms?

The term **waterways** includes rivers, streams, creeks, drains, ponds, wetlands and estuaries that go through or border your farm, whether they are dry or permanently flowing. It's also important to think about gullies, which often don't hold water but can be responsible for channelling runoff into main waterways during wet periods.

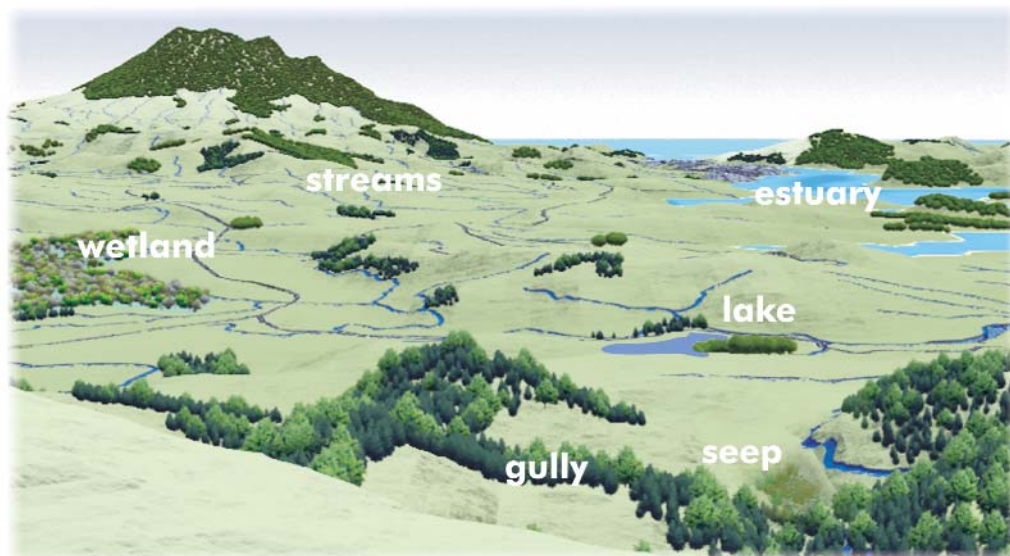


A well managed farm stream



A small stream affected by stock access

Figure 1 shows an example of a farming catchment with the various waterways in it.



Managing waterways can enhance farm management and help meet market demands, as well as improve water quality and freshwater life. There are several options for managing waterways and you can choose what suits your resources and goals.

How agriculture affects waterways

One of the first steps towards better waterways on your farm is to understand more about how farming can affect them. Understanding the principles means you can adapt management to suit your local situation.

There are four main pollutants coming from farms – nitrogen, phosphorus, sediment and faecal matter (containing bacteria and viruses). Table 1 shows why these things are a problem and how they get into waterways from your paddocks.

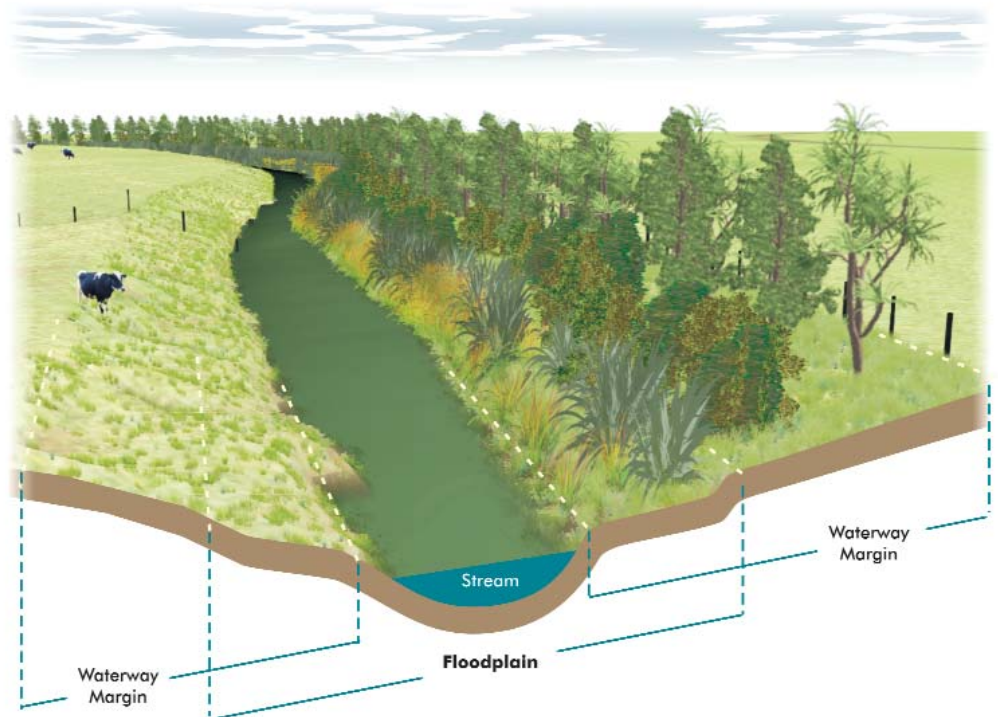
Table 1: Farm sources of water way pollutants

Pollutant	Why it is a problem	Source of pollutant	How it gets to water
Nitrogen	<ul style="list-style-type: none"> ● Feeds nuisance plant and algae growth in waterways ● Algae and nuisance plants affect stream life, block water intakes and make water unpleasant for swimming and drinking ● Ammonia can be toxic to fish 	<ul style="list-style-type: none"> ● Urine from stock ● Nitrogen in fertiliser ● Ammonia in dairy shed wastewater 	<ul style="list-style-type: none"> ● Moves down through soil (leaching) into ground water and subsurface drains, which feed into streams ● Surface runoff ● Stock in and crossing streams ● Discharges from oxidation ponds
Phosphorus	<ul style="list-style-type: none"> ● Feeds nuisance plant and algae growth in waterways ● Algae and nuisance plants affect stream life, block water intakes and make water unpleasant for swimming and drinking 	<ul style="list-style-type: none"> ● Dung from stock ● Phosphate in fertiliser ● Farm dairy effluent ● Soil sediment 	<ul style="list-style-type: none"> ● Soil and bank erosion (P binds to soil particles) ● Surface runoff ● Discharges from oxidation ponds ● Stock in streams ● Subsurface drains
Sediment	<ul style="list-style-type: none"> ● Makes water murky and affects stream life ● Poor water clarity makes water unsafe for swimming 	<ul style="list-style-type: none"> ● Slips ● Stream bank erosion and trampling ● Tracks and races ● Surface of paddocks 	<ul style="list-style-type: none"> ● Surface runoff ● Streambank collapse ● Slips
Faecal matter (bacteria, viruses)	<ul style="list-style-type: none"> ● Human health risk from swimming and drinking ● Can affect stock health if present in stock water 	<ul style="list-style-type: none"> ● Dung from stock ● Farm dairy effluent 	<ul style="list-style-type: none"> ● Stock in streams ● Subsurface drains ● Discharges from oxidation ponds ● Surface runoff ● Poorly managed effluent irrigation

Managing waterway margins can help

The area beside waterways that forms the interface between water and land is called the riparian or waterway margin (Figure 2). This area is an important buffer between land use activities and the natural waterway.

Figure 2 What is a waterway margin



Managing waterway margins can provide **farm benefits**:

- stabilise banks
- reduce stock losses (fencing them out of dangerous wet areas)
- enhance the farm landscape
- reduce the need to clear drains and streams
- exclude stock from natural water (which can sometimes carry disease organisms)
- make stock and grazing management easier.

Well-managed waterway margins protect **water quality** by:

- filtering surface runoff
- taking up nutrients (through plant roots)
- removing nitrogen (bacteria in wet riparian soils can remove substantial quantities of nitrogen from water, releasing it to the atmosphere as nitrogen gas)
- preventing stock access when they are fenced (reducing bank trampling and direct inputs to waterways of sediment, nutrients, and harmful faecal bacteria).

Waterway margins can provide food and habitat for **freshwater life**, for example:

- fish habitat – inanga spawn in grassy areas in the lower floodplain
- leaf litter, which is important food for aquatic animals
- shade – important for reducing water temperature for sensitive freshwater life. Shade also reduces the growth of nuisance plants in waterways.

Well-managed waterway margins are free from stock damage and will provide benefits for water quality, freshwater life, biodiversity and your farm.



Planted waterway margins can provide a home for native birds

Prevention is better than cure!

Well-managed waterway margins provide the last opportunity to keep farm pollutants out of waterways. However, adopting good management practices across the whole farm will help reduce pollution levels at their source, as well as enhancing your business.

Good farm management practices include:

- grazing carefully during wet weather to avoid pugging, pasture damage and soil erosion
- avoiding overgrazing steep slopes and areas beside waterways
- providing shade and shelter for stock, and water troughs, away from waterways
- applying fertiliser and pesticides with care, especially near waterways
- managing your dairy effluent effectively
- minimising runoff from farm tracks and races by providing cut-offs into grassed areas
- retiring steeper headwaters and reforesting or planting a timber crop
- preventing silage leachate from reaching waterways
- retaining wet swampy areas as sponges and filters
- keeping offal pits away from waterways.

For more information about management practices to improve environmental outcomes on your farm, ask your farm advisor, or contact Tasman District Council on 03 543 8400 or Marlborough District Council on 03 578 5249.

Well-managed waterway margins are the last opportunity to keep pollutants out of our waterways.



Careful fertiliser application is crucial near waterways

2

Bang For Bucks: What Works Where

This booklet describes four different approaches to managing waterways. See what suits your farm.

There are four key approaches to managing waterway margins on farms, based on the goals of:

- improving water quality
- enhancing freshwater life
- improving bank biodiversity.

The way you decide to manage your waterways will ultimately depend on your individual goals.

Four key approaches

1. **Animals out:** Fencing stock out of rivers, streams, drains, wetlands, lakes and estuaries.
2. **Fenced grass waterway margin:** Maintaining an ungrazed grass strip beside waterways, of at least one metre wide on flat land and wider on sloping land.
3. **Replanted native waterway margin:** Re-planting native vegetation beside waterways in a fenced ungrazed strip of at least five metres.
4. **Managed wetlands:** Managing wetlands, seeps, swamps and gullies to exclude stock during crucial periods.

On some farms, it might be appropriate to use a mix of all four approaches, while on others it may simply be appropriate to focus on one. Figure 3 shows the different approaches and how they can each achieve different benefits for your farm business, water quality, freshwater life and waterway banks. The success of each approach will depend on how you manage the waterway margin itself and the surrounding and upstream land.



A simple fence keeps animals out



Keeping stock out of seeps helps them to filter runoff

Figure 3: The benefits of different waterway management approaches

1. Animals out



Benefits

- reduces faecal bacteria in water
- eliminates stock induced erosion

2. Fenced grass waterway margin



Benefits

- reduces faecal bacteria in water
- helps keep bank stable
- filters P and sediment from runoff
- eliminates stock induced erosion.

3. Replanted native waterway margin



Benefits

- reduces faecal bacteria in water
- balance of shade and grasses can help keep bank stable
- improved habitat for fish and aquatic life
- habitat for native birds, insects and plants
- eliminates stock induced erosion.

4. Managed wetlands



Benefits

- reduces faecal bacteria in water
- filters out some P and sediment from runoff
- removes N from runoff and resurfacing groundwater
- eliminates stock induced erosion.

Developing a plan for action

If you're considering how to manage farm waterways better, it can be helpful to think about what you want to achieve and to set realistic goals. It might work best to do a little bit each year at critical places on the farm. That way you can learn what works best for you and your farm, and it's also easier to keep up with maintenance.

Here are some things to think about when planning¹:

- What do I value about the stream, drain, river, lake, wetland or estuary on my farm?
- What, if anything, is wrong with the condition of the waterway?
- How is my farm contributing to the condition of the waterway?
- What things are most important to me to protect or improve about the waterway? e.g. freshwater life, water quality, stable banks
- What management approaches listed in this booklet will help improve the waterway to meet my priority goals?
- What challenges am I likely to face in managing waterway margins on my farm and how can I best plan to deal with those challenges? e.g. flooding, pests
- What are the costs and benefits to me of managing waterways?
- Where are the areas on the farm that will give the biggest benefit for the least cost?
- How does waterway management fit in with other farm priorities?
- How will my management affect land downstream?
- How will upstream activities affect me?
- What are my neighbours doing about waterway management? Is there scope to work together? e.g. Landcare group
- How much time have I got to maintain managed waterway margins?
- What resources (incentives and advice from agencies, funding organisations, community groups and the farming industry) are available to help with waterway management?

We hope this booklet can help you answer some of these questions.

¹ Based on Ministry for the Environment, 2001.

Good planning helps keep the task of managing waterways realistic and manageable.



Good planning helps keep you focused

Animals Out: Fencing Stock From Waterways

What will it achieve?

By fencing your river, stream, drain, lake, wetland or estuary to keep stock out, you can expect to achieve:

- better water quality by reducing the amount of faecal matter and sediment directly deposited into the waterway. You'll also slightly reduce some of the N and P going into your waterways but additional management options will be needed if nutrient reduction is your main goal
- better aquatic habitat by preventing damage to the bed and reducing the amount of sediment reaching the waterway
- more stable banks by preventing treading and erosion
- farm benefits such as reduced stock losses in waterways (drowning and bogging) and reduced drain maintenance costs (less siltation).

Excluding stock from waterways is regarded as the best "first step" you can take to improve waterways everywhere in Tasman and Marlborough. Both the Tasman and Marlborough District Councils encourage farmers to minimise stock access to waterways. Tasman District Council can provide advice on which rivers and streams have special values that should be protected.

Deciding where to put your fence

There are pros and cons to either fencing to follow the bends of waterways or putting in a straight fence. A straighter fence needs less material and time but might mean more lost grazing. You may need to set your fence back further where banks are unstable or prone to flooding. Fenced banks are less likely to collapse but you may still get some flood damage from time to time.

It can be helpful to consider the overall layout of your farm. Fencing your waterways can be better value for money if you use new fences to improve subdivision for grazing management and stock control.

What sort of fence is best?

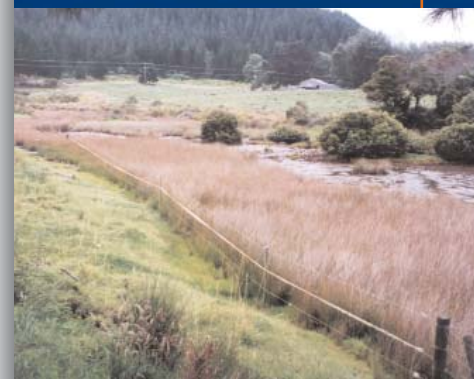
If you're running dairy cattle, a two or three wire electric fence with permanent posts is usually the best option for waterway fencing. However a single electric wire fence may be enough for dairy cows. Four wires may be enough for sheep if you use electric wires. It's a good idea to have a gate into your riparian areas, so that escaped stock can be easily retrieved.

3

Fencing stock out of waterways is the best "first step" towards improving water quality and protecting freshwater life.



Fencing drains helps improve water quality



An electric fence keeps stock out of a fragile estuary

A two to three wire electric fence with permanent posts can be a good option for fencing waterways.

Access

In areas where stock will need to cross a river, stream or drain, a permanent stock crossing is best. Section 5 provides more information about stock crossing options.

Occasionally you may need to use machinery to clean weeds, silt or debris out of drain channels. An electric fence can be dropped or removed to allow access but with a more substantial fence you might need to leave enough space between the bank edge and the fence for machinery to work. It may be sufficient to only do this on one side of the channel rather than both. Where the drain forms a boundary between two properties, access from both sides will be needed so cleaning can alternate between properties.

Remember that you may need a resource consent from your District Council to do work in a waterway – this is to ensure that damage to the stream bed and freshwater life is minimal. Contact either Tasman District Council on 03 543 8400 or Marlborough District Council on 03 578 5449 if you'd like more information.

Coping with floods

Flooding can be one of the biggest challenges for maintaining fences beside waterways. Simple one to two wire electric fences are less likely to collect flood debris and therefore be swept away in floods. They are also easier to stand back up after a flood event.

For drystock farmers who opt for seven to nine wires with posts and battens, flooding can cause expensive damage. Suggestions to reduce the damage and cost of repairs include:

- try five wire electric fencing along the most flood prone sections
- construct separate 'blow-out' sections across flood channels
- put fence wires on the downstream side of posts so they pop their staples and drop rather than breaking
- use un-barbed staples so wires can pop more easily
- avoid using battens in flood prone sections to reduce snagging.

Where there is potential for flooding, it's best to put your fence further away from the waterway. This is especially important on the outside bends of rivers and streams, where there is the greatest potential for erosion. When locating the fence, think about where the height of the bottom wire is in relation to expected flood levels. After large floods, it can be helpful to record the flood height to help with the placement of waterway fences in the future.

Making temporary fencing work for you

To help avoid impacts on waterways, you can use temporary electric fences to protect sensitive areas at critical times. For example, run a tape around wet areas and seeps during winter when you're grazing particular paddocks. This will avoid pugging, which damages the soil and creates dirty runoff. Pugging also damages grass growth, affecting your productivity. Having the area fenced off while stock are in the paddock will help filter runoff and reduce the chance of stock getting bogged.

Temporary electric fencing can also be used on slopes to keep cattle out of springs and wet areas that drain towards a stream. This allows the grass in the fenced area to filter dirty runoff coming from pugged pasture upslope, before it reaches the stream. When the soil is drier, the fence can be removed and the grass grazed.

Managing waterways without fences

In some situations, it will simply not be practical to fence all the waterways on your farm. While not optimal, there are some options for management without fencing:

- provide troughs with clean water away from waterways
- provide shade and shelter away from waterways
- keep stock numbers lower in paddocks with waterways to minimise damage
- avoid grazing paddocks with unfenced waterways during wet periods
- graze sheep, young stock or lighter stock in paddocks with waterways
- monitor grazing and move stock if they start to damage banks
- put in crossings in the areas where stock naturally cross waterways.

Stock watering options

Fencing off waterways sometimes removes a valuable source of stock water. Putting in a reticulated stock water system (using water from streams, dams or bores) can be expensive but will improve stock health and productivity. Studies show that a large variety of bacteria and viruses can be transmitted to stock from drinking water contaminated by animals and their waste². Putting in trough water and fencing off natural waterways also allows you to deliver animal remedies and supplements through your water system.

The Resource Management Act allows you to take water from rivers, streams, lakes or ground water bores for stock watering, as long as it doesn't have an adverse effect on the environment and you are reasonable with the volume you take. For more information, contact either Tasman District Council on 03 543 8400 or Marlborough District Council on 03 578 5249.

To help reduce pugging and runoff to waterways, use a temporary electric fence around wet areas when stock are in the paddock.



A temporary electric fence keeps stock off the left bank of the stream

² Australian and New Zealand Environment and Conservation Council, Agriculture and Resource Management Council of Australia and New Zealand, 2000.

4

Grassy waterway margins make effective filters to remove sediment, bacteria and some nutrients from farm runoff.



A wide grass margin provides an excellent filter for runoff

Fenced Grass Waterway Margins

For the purposes of this booklet, grass waterway margins are fenced, ungrazed grassy strips of at least one metre wide on the edge of rivers, streams, drains, lakes and estuaries.

What can grass margins achieve?

The main role of a grass waterway margin is to improve water quality, which will also provide benefits for freshwater life. Grass, native sedges and rushes are the most effective filter for removing sediment, bacteria and nutrients from surface runoff on relatively level ground.

Long dense grass slows runoff down so that sediment, phosphorus (which binds to soil particles) and faecal matter can settle out before the runoff reaches waterways. Studies show that up to 90 percent of sediment can be caught in an effectively constructed filter strip. Any faecal bacteria that are trapped in grass filter strips will die off in sunlight.

On top of the benefits you'll achieve by keeping stock out of your waterways, a well-managed grass margin will also provide:

- improved water quality by filtering sediment, phosphorus and faecal matter out of surface runoff
- some improvement for freshwater life by reducing sediment entering waterways and providing shade and cover along the bank
- some improvement in bank stability by having a protective groundcover of grasses.

Where is a fenced grass margin most important?

The effectiveness of a grass waterway margin will depend on³:

- the type of vegetation next to the watercourse – a dense grass sward makes the best filter
- the porosity of the soil – water may seep rapidly through very porous soils, taking soluble nutrients into waterways
- the width of the grass margin – within reason, the wider the better!
- the slope of the land beside the waterway – where adjacent land is steep, the grass margin will need to be wider, or may not be the most effective management option. You might need to consider alternative land uses to reduce erosion and adopt careful pasture, stock and farm track management.

In areas where tile and mole drains are widely used, a grass margin will not be as effective because runoff bypasses the grass margin and flows directly into waterways through the drains.

Across Tasman and Marlborough, grass waterway margins will be most effective at improving water quality:

- along drains and small lowland headwater streams that feed into the main floodplain rivers
- in areas with significant surface runoff
- beside waterways that are strip grazed in autumn and winter
- in the hilly upper reaches of streams
- beside vegetated drains in areas with poor soil drainage or pugging and moderate slopes
- where paddocks are cultivated⁴.

³ Northland Regional Council

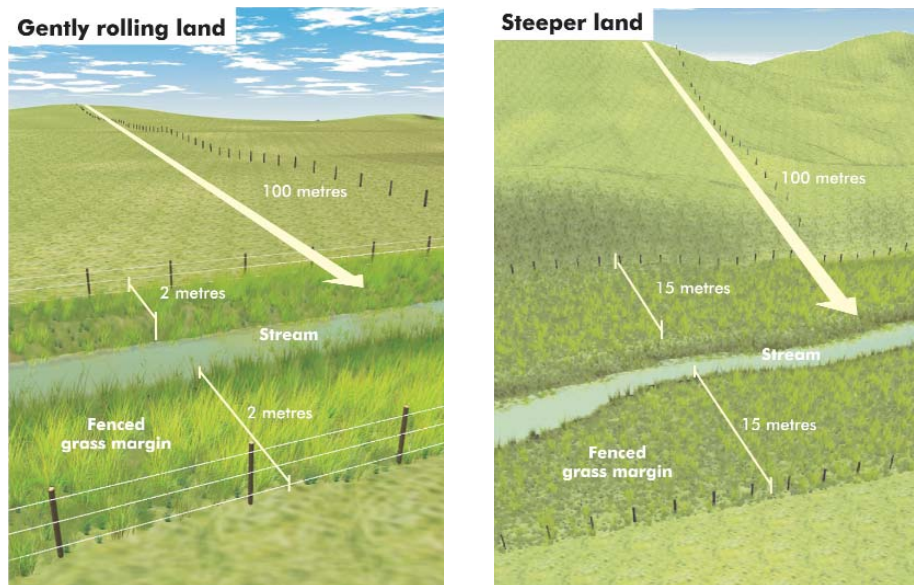
⁴ Quinn, 1999.

Management to get the most from your margin

How wide?

In general, the steeper and longer the slope is that feeds into the waterway, the wider the grass margin needs to be. Recent NZ research⁵ recommends that for gently rolling land, widths of one to three metres per 100 metres of slope feeding into the waterway are ideal. In areas with steeper slopes and poorly draining soils, a grass margin of 10 to 15 metres per 100 metres of the adjacent slope is recommended. See Figure 4.

Figure 4: Working out how wide your grass waterway margin needs to be



Often runoff flows in defined channels across paddocks to reach waterways. It can be best value to put in wider grass margins in the areas where you know runoff is channelled into waterways during times of high rainfall and runoff (Figure 5). On hill country farms with long slopes, wide margins are most effective across these drainage channels.

The steeper and longer the slope feeding into a waterway, the wider the grass margins needs to be to cope with the extra runoff.

⁵ Collier et al., 1995.

Figure 5: Using grass margins to filter channelled runoff



Narrow grass strips that occur where a fence has been placed very close to a waterway are not likely to provide much filtering benefit. However, you could use temporary fences to provide a wider strip during wet periods.

Grazing to maintain effectiveness and manage weeds

Weed growth can be a problem in fenced grass margins, especially blackberry, and it's important to manage weeds early on. Section 8 provides information on weed control.

Light grazing can be an acceptable management option on some sites, providing:

- there is a fence adjacent to the waterway to keep cattle out at all times – could just be a temporary electric
- grazing is in short bursts to minimise damage and runoff potential
- it will not damage tree and shrub planting or natural regeneration
- you don't graze during winter or wet periods to avoid pugging and runoff
- grass is given plenty of time to regrow before wet periods
- only sheep and lighter young stock are grazed, as they are less damaging to banks and soil than heavy cattle
- the bank is reasonably stable
- you are not within a whitebait spawning area. Inanga spawn in the grasses that are covered by water during high spring tides. Spawning occurs between March and May, but any grazing beside waterways should stop in February so grass can grow enough to filter any runoff and prevent erosion.

For more information about weed control, refer to Section 8 of this booklet or contact your local biosecurity officer at either Tasman District Council or Marlborough District Council.

Bridging the Gap: Stream Crossing Options

5

What's the problem?

If you have places on the farm where stock regularly walk through waterways, it's time to start thinking about alternatives. Regular stream crossings by milking herds have been highlighted as one of the main sources of water pollution in rural areas.

Studies indicate that stock directly depositing their waste into waterways has an equal, if not greater, impact on water quality compared to runoff⁶. One study measured that a 246 cow herd deposited 37 kg of faecal matter during two crossings of a stream⁷. They concluded that cows are 50 times more likely to deposit their waste in a stream than on a race.

Bacteria and sediment levels in waterways downstream of stream crossing sites generally significantly exceed water quality guidelines⁸. This poses a health risk to people swimming in streams and to stock where stream water is being used for stock drinking water supply.

Stock crossings are good for business

Putting in good stream crossings will benefit your farm business by⁹

- making travel times faster for both you and your stock
- improving stock health by reducing stress, lameness and the incidence of liver fluke
- providing easier access when streams are running high
- allowing new opportunities for farm management
- improving the value of your farm.

Good stream crossings also make a big difference to the stream environment by:

- preventing stock damage to the stream bed
- protecting stream habitat for fish and insects
- improving water quality by reducing the amount of sediment and bacteria getting into the stream from stock movement.

Looking at the options

To keep stock and animal waste out of waterways, the best options for crossings are either:

- culverts or
- bridges.

Culverts are an inexpensive option for streams that don't carry too much sediment and don't flood too high. However, they need to be chosen carefully and installed well to make sure they don't cause erosion and restrict the movement of fish up and downstream.

Bridges generally have less impact on stream banks, stream beds and water flow than culverts. They can be expensive but will often be a sound investment because they don't require as much maintenance and can provide many farm benefits.



Well designed stock crossing

⁶ Davies - Colley et al., 2001.

⁷ Davies - Colley et al., 2002.

⁸ Environment Canterbury, unpublished report 2001.

⁹ Tasman District Council et al., 2001.

Getting culverts right

When designing a culvert there are a number of factors to consider such as catchment size, maximum rainfall, stream slope and location in relation to other infrastructure (roads, houses etc).

It is important that culverts are designed appropriately. It's a good idea to get advice from an agricultural engineer – check out www.envirodirect.co.nz for a local consultant who can help. While it's important to avoid stock crossing through streams, the alternatives need to be appropriate for the site and well-designed to minimise any other potential risks.

It's important to make sure your stream culverts aren't restricting fish movement upstream. Poorly installed culverts can affect our trout, whitebait and eel fishery and our rare native fish. The main thing is to make sure the culvert isn't altering the natural gradient and bed of the stream.

If you have an existing culvert that drops down to the streambed preventing fish passage, consider building a simple rock ramp for fish. Use large rocks to form a zigzag staircase from the stream bed up to the downstream outlet of the culvert. This will slow the water down and form small pockets for fish to rest. It will also reduce the energy of the water coming out of the culvert, but shouldn't cause water to back up during floods.

If you'd like more information about providing for fish passage, contact Fish and Game New Zealand – Nelson Marlborough region.

And finally, the key to keeping your culverts in good working order is regular maintenance. Check your culverts for debris build-up at regular intervals, especially after heavy rain and flooding.

Building sound bridges

If you're thinking about putting in a bridge, work through the following steps to help figure out what you need.

Step 1: Think about what you'll be using the bridge for. This will help determine your design specifications. For example, large dairy herds might benefit from a wider deck surface, while heavy vehicles will require stronger load-bearing design.

Step 2: Contact your local Council to discuss consent requirements (see below).

Step 3: Contact your local bridge builder and engineer to discuss bridge designs to suit your situation – check out www.envirodirect.co.nz for a local consultant who can help.

Your local bridge builder will be able to estimate the cost of a suitable bridge. Using standard designs with precast abutments and deck slabs can reduce the time and cost of construction. Once your bridge is up, don't forget to put up a sign stating the weight and speed restrictions.



Poorly designed culvert (no level with bed, no fish access)



Well-designed culvert (level with bed, good fish access)

Rules for stream crossings

Make sure you contact your district council to determine if your stream crossing needs a resource or building consent.

Marlborough

The Marlborough Sounds Resource Management Plan specifies that you'll need a resource consent to install any culvert or bridge, regardless of size.

The Proposed Wairau/Awatere Resource Management Plan specifies that a resource consent is required to construct a culvert or bridge in stream that is over 3 meters wide. Installing a culvert or bridge in streams that are less than 3 metres wide may, in some circumstances, require a resource consent. It's best to contact the Marlborough District Council to discuss your situation.

Culverts over 3 metres high from the natural stream bed require a building consent. Bridges over 1 metre high from the natural stream bed require a building consent.

The Marlborough District Council aims to keep the resource consent process as simple as possible for farmers building bridges and culverts. An easy to use standard resource consent application has been produced for farmers in the Marlborough district. Contact the Council on 03 578 5249 for a copy of the standard application form.

Marlborough District Council also has an arrangement with Fish and Game New Zealand - Nelson Marlborough region, where in some situations a Fish and Game officer will assist the farmer in preparing their application for resource consent. For more information, contact Joanne Smart at Marlborough District Council or Neal Deans at Fish and Game New Zealand – Nelson Marlborough region.

The Marlborough District Council will process resource consents to eliminate stream crossing sites in the Rai River catchment free of charge. This only applies to applications lodged with the Council between 1 March 2003 and 1 March 2005 for bridges, and between 1 March 2003 and 1 March 2005 for culverts and stream diversions.

Tasman

In most cases the Tasman District Council requires that a resource consent be obtained for structures in or over a watercourse such as constructed stock crossings or farm bridges. Where possible the Council has streamlined this process for applications that result in stock being kept out of waterways. Contact the Tasman District Council on 03 543 8400 to check if you need a resource consent. In some situations, particularly with culverts, a Fish and Game officer may be able to assist you to prepare your application for resource consent. For more information, contact Fish and Game New Zealand – Nelson Marlborough region.

6

The major benefits of replanting waterway margins with natives are protecting freshwater life and providing habitat on the banks.



A replanted farm stream creates a farm asset

Replanting Waterway Margins

For the purposes of this booklet, planting your waterway margins involves re-establishing native grasses, shrubs and trees in a fenced strip of at least five metres wide. In this section we also discuss the use of exotic trees to help stabilise eroding banks.

What are the benefits?

The major benefit of replanting your waterway margins using trees and shrubs is protecting freshwater life and improving local biodiversity.

Farm benefits

- shade and shelter for stock on the other side of the fence
- recreational opportunities such as duck-shooting and improved fishing
- an attractive feature to look at (providing weeds are well-managed!)
- a uniquely New Zealand landscape.

Ecosystem and biodiversity benefits

- shades and cools water for freshwater life
- food for fish and insect life in waterways
- habitat for native plants and animals on the banks
- a seed dispersal corridor for native birds.

Water quality benefits

- filters some faecal matter, sediment and nutrients out of surface runoff
- takes up some nitrogen and phosphorus in plant roots
- improves bank stability if grasses are not shaded out.

Plan well to meet your goals

One of the secrets of a successful waterway planting is to be clear about your goals and to plan your planting approach to achieve them. While protecting freshwater life and local biodiversity are the key benefits of replanting, you might also want to maintain bank stability, improve water quality, and enhance your farm. It's important to incorporate these extra goals into a planting plan, as they'll require different planting combinations and management.

How wide should I go?

For a successful replanting project that provides maximum benefits for freshwater life while allowing some filtering and bank stability, it's best to retire between 5 to 10 metres of waterway margin. To create a self-sustaining piece of bush on the edge of a waterway where weed management is minimal, you'll need at least 10 metres¹⁰. Local biodiversity will benefit the most where waterway margins include existing pieces of bush and link them together.

¹⁰ Parkyn et al., 2000.

Balancing shade and bank stability goals for streams and rivers

Providing shade is the most important way to enhance stream life. Shade keeps water temperatures down for stream life and prevents nuisance water weeds and algae from growing. Leaf litter from planting also provides food source for stream life. At least 200 metres of stream length must be shaded to reduce stream temperature.

Research¹¹ indicates that if you want to replant your stream bank with natives but keep your banks stable, it's important to maintain a good cover of grasses on the bank edge. Planting too densely can shade out the native grasses and sedges on the very edge of your bank that often do the most to hold banks up.

Under natural conditions, forest streams are wider and shallower than pasture streams. Restoring native vegetation with maximum shade for stream life is likely to result in the channel widening and becoming shallower over a period of up to 20 years. In practice, this means bank erosion will probably increase for a reasonable period of time, which is not good news for many farmers.

If bank erosion is an issue on your farm, here are some practical tips to help you achieve a balance between replanting and erosion control:

- keep shade levels at between 50 to 70 percent to make sure the grasses and sedges on the bank are not shaded out. Scientists estimate that 50 to 70 percent shade occurs where your combined bank and vegetation height is about equal to the stream channel width¹²
- keep shade levels low in areas where erosion is a problem
- on small narrow streams, plant long grass or sedge species (e.g. native *Carex* species) that provide some stream shade, native habitat and bank stability
- in a wide waterway margin, plant trees back from the stream and let grasses occupy the immediate bank.

If restoration is your top priority, you want minimum weed control and maintenance, and you are prepared to accept some initial erosion, then dense plantings that provide up to 90 percent shade for the stream will create conditions that are close to native forest. Make sure you plant far enough back from the channel to allow for the erosion that is likely before your trees are well-established.

Using trees to stabilise stream banks

The most effective trees for stream bank erosion control are exotic willows and poplars. These are planted as stakes (less than 1 metre) or poles (1.5 to 3 metres). Make sure you avoid invasive spreading species such as crack, grey and weeping willow, silver poplar and all non-sterile tree and shrub willows. Before you plant fast-growing trees, think about their longer term maintenance needs.

The best time to plant these species is in winter, before the stakes or poles sprout new growth. Plant about a third of the length below ground. On waterlogged ground, you can force them in by hand. On firm ground, you may be able to sharpen poles at one end and drive them in with a rammer or use a post auger. Stakes can be planted by putting them into a hole made with a length of reinforcing rod or similar. The most important thing is to make sure stakes and poles are firmly planted.

When replanting stream banks, consider the effect of shade on the grasses and sedges that stabilise fragile bank edges.



Trees and shrubs set back from bank edges

¹¹ Ruthford et al., 1999.

¹² Davies-Colley and Ruthford, 2001.



Poplars help stabilise a stream bank

To effectively stabilise banks:

- pair-plant along straight reaches, so roots interlock underneath the streambed – one tree on one bank, one tree on the opposite bank, five to seven metres apart. This makes sure that the second tree prevents bank scour by current deflected from the roots of the first
- plant at 2 to 3 metre spacings at critical points, such as the outside of bends where erosion is greatest
- avoid planting on the inside of bends – these are sites where soil builds up rather than erodes, so any trees will trap sediment and force current against the outer bank
- avoid planting narrow channel reaches where trees might impede floodwaters.

By the time trees are 4 or 5 years old, there will be a solid mass of roots along the bank. At between 10 to 20 years, trees can be thinned to 10 to 12 metre spacings but no wider. Don't let stock graze around pole plantings for the first two years. If you plan to graze around the trees occasionally once they're older, use 'Netlon' or 'Dynex' sleeves on poles to protect them.

New research into the use of natives for bank stabilising shows that ribbonwood is deep-rooting and has a good root spread¹³. Planting ribbonwood alongside exotics will help maintain a mostly native planting on your banks.

For more information about sourcing and planting poplars and willows for bank stability, contact either Tasman District Council or Marlborough District Council.

Improve water quality with an extra filter

If you want to build a water quality filter into your replanted margin to deal with surface runoff, you'll need to include a grass or sedge strip of at least one metre wide on the paddock edge. Check back to Section 4 for more information about how these areas need to be managed.

¹³ Phillips et al., 2001.

Planting Guide

If you have decided to plant your waterway margin, this section provides you with practical advice on how to go about it, including when, how and what to plant where.

Prepare a planting plan

If you have a large area of waterway margin that you'd like to replant over time, it could be helpful to prepare a planting plan:

- have a good look at your site to check out the slope steepness and length beside the waterway and the areas that flood easily
- decide how wide an area you can afford to remove from grazing and replant, given your goals for the project and the constraints of the site. Think about where you might need access gates or walkways
- divide your waterway margin into the three plant zones (see Figure 6) and make a list of plants you can use in each zone. Work out roughly how many plants you'll need – in the area closest to the water and in the flood zone, allow 1 to 1.5 metre spacings. On higher ground, allow around 1.5 to 2 metre spacing for natives
- think about how much area you can afford to plant in any one year and don't forget to factor in the labour you'll need to keep it free from pests and weeds, especially in the first three years (see Section 8 of this booklet for more about weeds and pests)
- visit your local native plant nursery to find out what species they stock, costs, and how many plants you might be able to order. If you can, use plants sourced locally as they'll be best adapted to local conditions. Local seed stock also helps maintain the ecological integrity of your plantings. Your local council may have local plant lists already prepared
- order plants well in advance.

What to plant where

A waterway margin can generally be divided into three zones (A, B or C) for planting (see Figure 6).

The basic plant list in Table 2 gives an idea of the different plants that will suit your waterway margin. This list includes plants that should grow in most parts of Tasman and Marlborough on exposed grass-covered waterway margins. It also includes plants for wetlands or seeps (zone D) – see Section 9 for information about managing these areas. If you'd like more information about other native plants that are specially suited to your local area, talk to your local native nursery, District Council or the Department of Conservation. Tasman District Council has planting guides available for many of the lowland areas in the district.

When selecting the right plants for your site, it's important to choose:

- species appropriate to each planting zone (A, B, C)
- species that can tolerate local frost conditions
- only coastal species if you're in a coastal area
- species tolerant of the predominant soil moisture conditions on the site
- high quality plants grown from local stock
- plants that have been well-hardened to open conditions.



Plan your planting well to keep the project manageable and increase your level of success.

Figure 6: Waterway margin planting zones

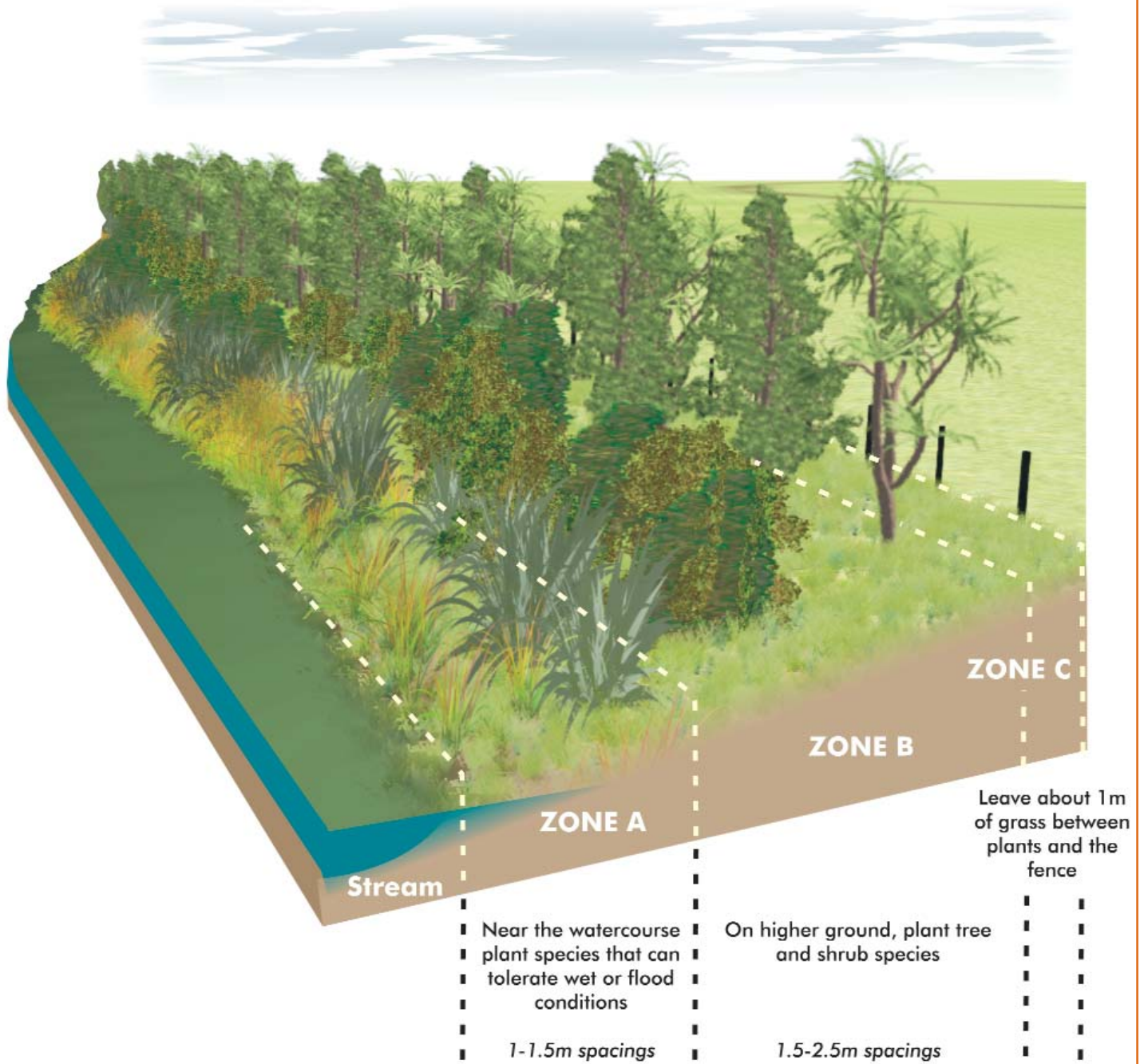


Table 2 Native Waterway Margin Plant Species for Tasman-Malborough Region

Scientific Name	Common Name	Plant Type	Suitable for		Tolerant of				Suitable for		Growth rate	Recommended plant spacings	
			Zone A	Zone B Zone C Wetlands or seeps	Heavy frost	Light frost	Boggy soils	Flood currents	Periodic flooding	Dry soil			Full sun
A. Primary plantings (suitable for planting on open, exposed sites)													
<i>Plagianthus regius</i>	Ribbonwood	Tree	√		√	√			√		√	Medium	1.5-2m
<i>Alectryon excelsus</i>	Titoki	Tree	√						√		√	Medium	6m
<i>Cordyline australis</i>	Cabbage tree	Small Tree	√		√	√	√	√	√	√	√	Medium	1.5-2m
<i>Kunzea ericoides</i>	Kanuka	Small Tree	√		√	√			√	√	√	Medium	1.5-2m
<i>Olearia paniculata</i>	Akiraho	Small Tree	√	√	√	√	√	√	√			Fast	1.5-2m
<i>Pittosporum eugenioides</i>	Lemonwood	Small Tree	√		√	√			√	√	√	Medium	1.5-2m
<i>Pittosporum tenuifolium</i>	Kohuhu	Small tree	√		√	√			√	√		Fast	1.5-2m
<i>Leptospermum scoparium</i>	Manuka	Small tree	√	√	√	√	√	√	√	√	√	Fast	1.5-2m
<i>Dodonaea viscosa</i>	Akeake	Small tree	√			√			√	√	√	Fast	1.5-2m
<i>Coprosma crassifolia</i>	Thick-leaved coprosma	Small tree	√			√			√	√	√	Medium	1.5-2m
<i>Aristotelia serrata</i>	Wineberry	Shrub	√		√	√			√	√	√	Fast	1.5-2m
<i>Coprosma propinqua</i>	Mingimingi	Shrub	√	√	√	√	√	√	√	√		Medium	1.5-2m
<i>Coprosma robusta</i>	Karamu	Shrub	√			√			√	√	√	Fast	1.5-2m
<i>Hebe species</i>	Koromiko	Shrub	√		√	√			√	√	√	Fast	1.5-2m
<i>Melicytus ramiflorus</i>	Mahoe	Shrub	√			√				√	√	Medium	1.5-2m
<i>Coprosma repens</i>	Taupata	Shrub	√			√			√	√	√	Medium	1.5-2m
<i>Phormium cookianum</i>	Mountain Flax; Harakeke	Flax	√	√	√	√	√	√	√	√	√	Medium	1.5-2m
<i>Phormium tenax</i>	Flax; Harakeke	Flax	√	√	√	√	√	√	√	√	√	Medium	1.5-2m
<i>Carex secta</i>	Pukio	Grass	√	√	√	√	√	√	√	√	√	Medium	1-1.5m
<i>Cortaderia richardii</i> ¹⁴	Toetoe	Grass	√	√	√				√	√	√	Medium	1.5-2m
B. Secondary plantings (require some shelter from existing plants)													
<i>Sophora microphylla</i>	Kowhai	Tree	√						√		√	Medium	1.5-2m
<i>Podocarpus totara</i>	Totara	Tree	√	√	√			√	√		√	Medium	2m
<i>Dacrycarpus dacrydioides</i>	Kahikatea	Tree	√	√	√	√	√	√			√	Med-Slow	2m
<i>Dacrydium cupressinum</i>	Rimu	Tree	√		√						√	Med-Slow	2m
<i>Pseudopanax crassifolius</i>	Lancewood	Small tree	√			√			√	√	√	Fast	1.5-2m
<i>Griselinia littoralis</i>	Kapuka, Broadleaf	Small Tree	√		√	√			√	√		Medium	1.5-2m
<i>Pseudopanax arboreus</i>	Five finger	Small tree	√			√			√	√	√	Fast	1.5-2m
<i>Schefflera digitata</i>	Pate	Small tree	√			√	√				√	Medium	1.5-2m
<i>Carpodetus serratus</i>	Putaputawetae	Small tree	√			√				√		Medium	1.5-2m
<i>Pseudopanax ferrox</i>	Fierce lancewood	Small tree	√			√			√	√	√	Fast	1.5-2m
<i>Poa cita</i>	Wiwi, Silver Tussock	Tussock	√		√	√			√	√			
<i>Dicksonia species</i>	Tree ferns	Tree fern	√			√					√	Slow	2m
<i>Cyathea species</i>	Tree ferns	Tree fern	√								√	Slow	2m

¹⁴ Not to be confused with the two species of the introduced weed pampas, *Cortaderia jubata* and *Cortaderia selloana*. The dead leaves of pampas curl up into brown spirals, while NZ native cutty grass, toetoe, doesn't.

Good site preparation (fencing, weed and pest control) is essential to get plants off to a good start.



Native plants in bags waiting to be planted

Good timing

Most native species should be planted between late April and early September. If you're in an area that doesn't get heavy winter frosts, it can be better to plant in autumn (late April to early June) so that plants are in a better condition to respond well in spring. If you get harsh frosts, plant in spring.

Ideally, you should plant the most hardy species first to establish initial cover (e.g. manuka/kanuka, cabbage trees, *Coprosma robusta*). After one to two years, plant the frost and wind tender or slower growing species (e.g. tree ferns, rimu, kahikatea) wider apart (about 6 m spacing).

Exotic trees can be purchased bare-rooted but native trees are usually bought in bags or root trainers. Root trainer seedlings can be kept for a long time but have smaller root systems which reduces their chances of survival. Seedlings should ideally be hardened off in the open for a month before planting.

If you don't want to do much maintenance, buy bigger trees (up to a metre tall, but check they are not root bound). If you plant smaller seedlings, you'll need to release them regularly from weeds.

Getting the site ready

Fencing

All areas where you plan to plant natives should be fenced to exclude stock before you start. Fencing should be permanent, because areas planted with natives will not cope with grazing.

Weed control

Give your plants a head start, and reduce your future workload, by clearing planting areas of invasive weeds such as gorse and blackberry beforehand – they grow quickly and will smother or out-compete young seedlings. Section 8 provides information about dealing with specific weeds. If your site has large amounts of old gorse, you may like to think about cutting light wells and under planting it.

Use either a herbicide or a spade to clear weeds and grass in circles of about 1 metre round for each plant. Glyphosate herbicides (e.g. Roundup) are good for removing weeds in large areas and are generally accepted as the safest sprays to use beside waterways. Contact Tasman District Council to find out more about their rules to avoid spraying directly onto water or allowing runoff into water.

Native plants are very sensitive to herbicides, so it's best to spray well before you intend to plant. Make sure you use herbicides at the recommended rates and spray in an s-shaped pattern to avoid overlap. Use a spade to clear grass and weeds on smaller areas if you have the time.

Having mulch on hand can also help avoid weed problems later. A thick layer of newspaper weighed down with clods of soil, or a one metre square of carpet or non-synthetic underlay split to place around the tree, will make effective mulch. Take care not to place any organic mulch up against the stems of native plants as it can damage them.

The most effective way to deal with unwanted tree species like invasive poplars and willows is to paint the stumps with herbicide immediately after cutting. Alternatively, drill holes in the base of each willow tree at a 45° angle and inject 80ml of glyphosate (this method only works in summer). Avoid putting live willow off-cuts in or near waterways, as they'll take root and grow – and you'll end up back at square one!

If you want to remove vegetation along waterway margins in the Tasman District, contact the Tasman District Council to find out if you'll need a resource consent. They can advise about how best to minimise the amount of sediment and vegetation that ends up in the waterway, so you don't restrict water flow and affect fish passage. It's also important to replant as soon as you can to help stabilise the banks.

Pest control

Rabbits and hares love native seedlings on pasture land, so it pays to do some control before you plant. If you have any idea about what the pests in your area prefer to dine on, choose some of their less favourite species to plant densely along the fencelines that pests approach from. Using larger trees (with trunks thicker than a finger width) discourages hares from slicing them off. Commercial repellents can also be used to protect young trees from rabbits and possums – these are available from horticultural suppliers or stock and station agents. For more information about pest control, see Section 8 of this booklet.

Pukeko can be quick to undo your flax and sedge plantings by nibbling and uprooting. Planting bigger seedlings (40cm high) can help to ensure their survival.

Getting your plants in the ground

- an overcast, wet or windless day is best for planting
- handle plants carefully to avoid root damage
- set out plants in their zones and correct spacings
- dig a good size hole and loosen the soil
- set the plant in the hole and fill three quarters full. Give the plant a very gentle lift to set the roots in a natural position and continue filling with soil, firming as you go
- water at the time of planting. In dry areas, you may need to continue watering during summer for the first two to three years
- stake plants to help find them again at weeding time
- use mulch to help control weeds and retain moisture.



Spot spraying gives new plants a good weed-free start



People planting streamside

Keeping on top of maintenance (fencing, weed and pest control) is critical to the long-term success of your planting.



Pukio (carex secta), a flood resistant native grass suitable for bank edges

Ongoing maintenance

Waterway fences may often be regarded as a lower priority for maintenance compared with other farm fences. But remember that you're also protecting a planted asset behind those fences, which could quickly be devalued if your stock gain access.

Silviculture

A canopy of native shrubs and trees will need little tending once they are established. Where trees have been planted for erosion control or timber production, some silviculture will be important. Erosion control trees will benefit from some initial form pruning to maintain a good central leader. This should be followed by some side pruning 5 to 10 years after planting to reduce shading of grasses and shrubs underneath.

Additional Planting

You can't expect 100 percent success with any tree planting but if you plant good quality seedlings of the right species, at the right time of the year and protect them well, you can expect 70 to 80 percent to survive. It's helpful to replant in the spaces where you've lost trees, to reduce gaps for weeds to grow in the future. Most deaths will occur in the first few months, so keep an eye on your plantings and if you need to replant, do it as soon as you can to keep weeds out.

Once the hardy pioneer species have established, other native plants might start regenerating amongst your planting as birds spread seed. If you'd like to speed up this process, plant additional trees and shrubs in the gaps between established plants. There are many slower growing species you can introduce under the shelter of the pioneer species – the plant list in Table 2 gives some examples. You can also contact your district council to get a plant list for your local area.

Now you can enjoy watching your planting grow, along with the native birds and insects it will attract!

Managing Weeds and Pests

8

Weed Control

Plantings beside waterways are often criticized as being havens for weeds. Without a doubt you will need to commit some time and resources to your planting if you want to keep the area weed-free. A weed problem is most likely to arise where trees and shrubs are planted too small, are poorly released, or planted too far apart. Keeping up your weed control over time is critical to the management of your retired waterway margins.

Principles for keeping on top of weeds

There are some general principles you can follow to keep weed control manageable along planted waterway margins, saving you time and money:

- remove all weeds from the site before you fence or plant it
- if you don't have much time for weed control, plant larger plants at close spacing (no more than 1.5 metres apart) to reduce weed competition. Planting close may cost more upfront but will pay off in the long-term
- start by planting a smaller area and maintaining it well, moving on to other areas once the initial site doesn't need so much attention
- check on weed growth regularly in planted areas, especially during spring and summer. Controlling weeds in the early stages is generally much easier than dealing with mature infestations
- consider paying someone else to weed your planted areas during busy periods if you don't have time. It might save you the cost of replacing your plants the following winter
- release your plants regularly for the first few years to avoid high plant losses. Once seedlings start to shade the ground, you won't need to do so much
- keep on top of shade-tolerant weeds
- use stakes to mark the position of seedlings – this can help you to find them for releasing
- identify your weeds and get good advice about the most efficient and effective way to control them. Contact your regional council, local plant pest contractor or farm supply store for advice about specific control methods
- take care with herbicides around native plants because they are very sensitive. Avoid blanket spraying as this will open up gaps for invasive weeds.

Control of common waterway weeds

The most common weeds growing along waterway margins in the Marlborough and Tasman District are blackberry, gorse, broom, Old Man's Beard, hawthorn, barberry, willow, himalayan honeysuckle and Tradescantia (wandering willie).

It's important to factor in time and resources for weed and pest control if you want to keep your waterway plantings in good condition.



Newly planted seedlings marked with stakes

Weed	Control Methods	Suggested Herbicides
Bloom and gorse	<ul style="list-style-type: none"> • Mechanically remove smaller plants, including roots. Spray regrowth. • Spray mature plants • Drill and fill individual stems • Cut stems and apply Vigilant premix gel to stumps 	<ul style="list-style-type: none"> • Amitrole, activated Amitrole, • Escort, Grazon, RoundUp, Tordon BK, Touchdown, Versatill
Blackberry	<ul style="list-style-type: none"> • Cut first and then spray with herbicide 	<ul style="list-style-type: none"> • RoundUp (safe around natives) • Amitrole, Grazon, Renovate, Escort, Answer (in absense of natives)
Wandering willie	<ul style="list-style-type: none"> • Remove plants by hand or rake them up as a mat – don't spread fragments as they will grow. Compost on site under black plastic. • Spray with herbicide. 	<ul style="list-style-type: none"> • Amitrole, Escort, Grazon, Revonate, RoundUp or Tordon 50D
Old Man's Beard	<ul style="list-style-type: none"> • Cut large vines, hanging trailing ends off ground and stump treat immediately with herbicide • Small infestations - spray or hand pull and leave to dry off the ground • Complete before mid February to stop seed set 	<ul style="list-style-type: none"> • Grazon, Tordon, Escort, RoundUp or apply Vigilant premix gel to the cut ends.
Convolvulus	<ul style="list-style-type: none"> • Remove by hand, with follow-up spraying of re-growth 	<ul style="list-style-type: none"> • Tordon, Buster and Touchdown
Barberry and Hawthorn	<ul style="list-style-type: none"> • Spray or paint stumps 	<ul style="list-style-type: none"> • Escort, RoundUp, Grazon, Tordon

You're generally best to contact a biosecurity officer at your district council for site specific advice, as control methods will vary. It's good to get advice before you start, so you can design and implement the right weed control programme for the job. For example stump treatment requires different concentrations to spraying, and some brushweed herbicides might kill your grass as well. Make sure you always follow the label instructions and remember not to spray over water.

Pest control

It's important to protect your waterway margins (and your investment in them) from animal pests too.

Rabbits and hares

Planting larger trees will reduce the impact that rabbits and hares will have, but ongoing control is important for smaller plants. Rabbits need to be controlled until the growing tips of seedlings are above bite height. If hares are a problem in your area then control is needed until the diameter of the plant stems are fairly large to prevent them from being bitten through or ring-barked.

A variety of control methods are available, including shooting, fumigant poisons, baits and exclusion fencing. It may be useful to try animal repellents to deter rabbits and hares – these are available from horticultural suppliers or farm supply stores stock or you can make your own up.

Possums

In most areas, some ongoing possum control will be necessary to protect your plantings. Possum control also has the added benefits of reducing the amount of pasture they eat and protecting your fruit trees and gardens. There are a variety of control methods available, each with their own benefits and tradeoffs. Bait stations for possums (and rabbits) can be an effective low-input control method in waterway margins. Traps are higher maintenance, but once you've purchased them the only cost is your labour. Night shooting can also help in narrow waterway margins, but is not usually effective in larger bush areas.

Goats

Goats can make short work of lush young plantings and they will get through most fences! Not running goats on your property is the best way to reduce this risk. Feral goats should be eradicated.

Other pests

As your planting matures, it will attract birds and insects. Controlling rats, mice, stoats, ferrets and cats will help keep your planting a healthy habitat for them. Most of these pests can be targeted together with certain poisons, but each requires a different trapping method if poisons aren't used.

Talk to the biosecurity staff at Tasman or Marlborough District Council for advice on pest control methods to suit your situation.



A fence post makes a good home for a possum bait station

9

Well-managed wetlands, seeps and swamps are valuable filters to remove sediment, bacteria and nutrients from runoff and resurfacing ground water.



A small gully seep could make a good filter for runoff

Managing Wetlands, Seeps And Swamps

Wetlands are unique and threatened features of the Tasman and Marlborough landscape. Both Tasman District Council and Marlborough District Council encourage landowners with wetlands on their properties to consider protecting and restoring these areas as important natural habitats.

Smaller wet areas, seeps and swamps can also play a valuable role in filtering pollutants out of runoff and ground water. This section focuses on how to manage these areas to protect water quality.

If you'd like to know more about wetland restoration, contact your local District Council. Fish and Game New Zealand, Department of Conservation, Landcare Trust and the Tasman Environmental Trust may also be able to help with advice and financial assistance for protecting wetlands.

What can managing wetlands achieve?

Think of wet areas as giant filtering sponges – sometimes described as the kidneys of the landscape! Wetland plants slow the flow of water off the land and in times of flood, water is absorbed into the organic wetland soils. In summer, stored water is released slowly, which helps maintain water flows, providing better habitat for stream life.

Wetland plants trap waterborne sediment, cleaning up water before it gets to rivers and streams. In the right conditions, bacteria living in damp wetland soils can convert up to 90 percent of the nitrogen from farm runoff into nitrogen gas, which is then released into the atmosphere. This helps prevent algal blooms and nuisance plant growth in our waterways.

In summary, managing wet areas, seeps and swamps on your farm can:

- improve water quality by filtering sediment, faecal bacteria, N and P from runoff
- improve water quality by removing soluble nitrogen from runoff and re-surfacing ground water – in some soils managed wetlands are the most effective solution to reducing the amount of nitrogen reaching waterways
- provide habitat for eels, native fish, birds and insects, improving local biodiversity
- reduce stock losses from bogging and improve stock management
- help reduce flood peaks and maintain summer water flows.

Where is wetland management most important?

Managing wet areas, seeps and swamps will have the most impact on water quality in the headwaters of catchments. It is also a very important management approach in areas where waterways are particularly sensitive to nitrogen or where high nitrogen levels in ground water have been identified as a problem.

To drain or not to drain...

On a purely economic basis, the capital outlay of draining wet areas might be cheaper than buying more land. But you may require a resource consent, there's usually a risk that the drained area will remain wet, and you'll have the ongoing cost of drain maintenance. When you take this into account, it can sometimes be more profitable to put a fence up instead, concentrate on your better land and leave your wetland filters intact. Fencing out stock can also save you money in animal health and time spent on stock management.

Managing your natural filters

Once nitrogen has found its way into ground water, it can only be treated where the ground water reappears at the surface e.g. at springs, wetlands and seeps. Keeping these wet areas and the grasses and rushes that typically grow there is essential if you want nitrogen removed from your emerging ground water. If there is plenty of suitable organic matter, low oxygen levels, and reasonable water retention time, in excess of 90 percent of nitrogen can be removed¹⁵.

For wet areas to be most effective as filters they:

- must remain wet for all or most of the year. Many wet areas on farms have already been drained. If you want them to improve water quality, they'll need to stay wet
- must be fenced off from stock. Most sedges, rushes and flax are palatable to stock. These plants need to be protected as they have an important role in slowing flow, filtering water, and providing a carbon source for the bacteria that remove nitrogen. Cattle trampling will also reduce the ability of wet areas to absorb water
- may need some planting. Native sedges, raupo, rushes and flax grow well in these areas and are easy and cheap to get. They can all be split and the sections planted out. Trees can be counter-productive in or beside wetland areas as they dry the soil out and shade the smaller plants.

If you really want to make good use of wetlands, swamps and seeps to improve water quality on your farm, you can use them to filter runoff from a variety of sources. For example:

- direct tile and mole drains into wetlands before they flow into streams
- divert race and track runoff into wetland areas but take care not to smother the area with sediment.

Using temporary fencing as a management tool

If some of the wet areas on your farm are too difficult or inconvenient to fence permanently, you'll improve water quality benefits if you use a temporary electric fence during the wetter months. It might take a bit of extra time to put up a fence but it will keep stock from getting bogged and reduce the amount of dirty runoff. As for the lost grazing, often the wet areas pug up quickly in winter and are of limited feed value anyway – it could be better to save them for summer grazing when feed is short.

Managing wetlands is the best way to keep soluble nitrogen out of waterways.



A simple fence excludes stock from seep

Wetlands need to stay wet and be free from stock trampling to be effective filters.

¹⁵ Ministry for the Environment, 2001

Managing Drains For Multiple Benefits

The many roles of a farm drain

Drains are essential for the development and improvement of many farm businesses.

They are very effective in:

- channelling surface runoff (and pollutants) from paddocks
- reducing flooding
- lowering water tables.

But there's more to farm drains than meets the eye. It's important to realise that farm drains:

- are not isolated waterways. They almost always flow into natural streams that connect into rivers, wetlands, lakes and estuaries. Drains can act as very efficient channels for nutrients and faecal bacteria to travel into larger waterways.
- can be important habitats for some of our endangered wetland plants and animals such as eels, trout, whitebait and native water birds. Wetland drainage and removal of streamside vegetation means that drains are often the only habitat left for important native species such as mudfish and banded rail.

This section provides some ideas about how to manage your drains to meet your farm objectives as well as maintain water quality and habitat for native plants and animals.

Water weeds have good points¹⁶

Weedy plants in drains can be a problem when they block channels, increasing water tables and flooding. But that's not always the case.

It's a good idea to decide whether the weeds in your drain really are a problem before you spend time and money to remove them. Water plants can provide many benefits:

- they stabilise banks and bed sediments, helping to reduce erosion. Removing them with a digger or by spraying can cause the bank to slump, the drain to silt up and erosion of pasture
- they provide habitat for fish (including eels), koura, insects and birds. Bank-side plants shade the water, keeping it cool for sensitive species. They also provide a habitat for wildlife
- they take up dissolved nutrients from the water, helping to lower the amount of nutrients flowing into downstream rivers and lakes where they can cause nuisance algal blooms.

There are plenty of reasons for leaving weedy water plants alone if they're not interfering with drainage or causing a flood risk.

¹⁶ NIWA, 2003.

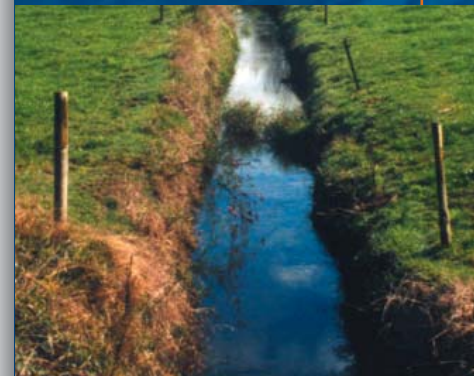
Managing drains to reduce maintenance

Drains only need to be maintained if they're becoming blocked with silt or weeds. Maintaining drains is a cost to the farm business and, depending on how you do it, can also affect water quality and wildlife.

Prevention is always better than the cure, so the best strategy is to manage drains to reduce the need for maintenance, keeping your costs down.

Good management practices that can reduce the need for drain maintenance include:

- fence all drains to reduce siltation from stock damage to drain banks. Where permanent fencing isn't practical, use a single electric wire to stop cattle from crossing
- only spray the weeds in the bed of the drain (when they're dry), not those on the banks, because grassy banks are more stable than bare earth. Check with your district council about rules for spraying over or near water
- leave an ungrazed grass filter strip beside drains to filter nutrients and sediment from runoff. Make the strip wider at low points where runoff collects
- if you're cultivating in drained paddocks, make sure you stop at least two metres away from the drain bank to reduce sediment loss
- if you want to plant trees, plant taller trees on the north banks of drains to provide shade – this will reduce weed growth and water temperature. But remember to allow access for cleaning equipment on the south bank. Grow lower plants that won't disrupt cleaning – for example, the native grass *Carex secta*
- establish drains with flat batters, rather than steep banks. This will concentrate flow and help provide a weed-free central channel that doesn't need much maintenance
- ensure good access to drains so that they're easy to get to if you do need to clear them. This includes putting in gateways in drain fences. Poor access can make the job more time-consuming and difficult, increasing your costs.



A well fenced farm drain

Reducing the impact of mechanical drain clearing

Mechanical drain clearing with a digger is one of the most common methods used by farmers. While this method can be quick and seem effective, mechanical clearing can:

- change the shape of drains and the way water flows, reducing their long-term effectiveness
- disturb silt and make drain water dirty, affecting fish and insect life.
- remove insects, fish, eels and crayfish from the drain
- distribute weed fragments downstream where they can regrow and cause further problems.

To reduce the impacts of mechanical drain clearing, consider the following good management practices¹⁷:

- use a digger with a weed-rake or a stream-cleaning bucket because this allows water and stream life to escape back into the drain
- inspect the drain with the digger driver beforehand. Identify any riffles or areas that shouldn't be disturbed and mark these with aerosol paint or pegs
- don't dig out the whole length of the drain. Instead, dig out stretches of 10-20 metres and leave the next 10-20 metres undisturbed
- create shallow battered drains rather than wide, flat bottomed ones with steep sides
- leave a buffer of weed at the lower end of the drain to trap silt. Clean this area last
- avoid excavating during peak fish spawning and migration and bird nesting periods. Only clear tidal zone drains between October and January. Avoid disrupting the main whitebait spawning period from February to April. Clear drains in other areas between mid October and April.

Creating a V-shaped channel¹⁸

Drains are typically cleared leaving steep vertical banks and wide, flat bottoms. This spreads out water flow, slowing it down and causing the build-up of sediment. Slower water becomes warmer, which in turn encourages weed and algae growth.

Ideally, the slopes of drain banks should be less than 1:2 – that is one vertical unit to two horizontal units of distance (Figure 7). This maintains a faster water flow in the centre of the channel, reducing sediment build-up and weed growth.

Gently-sloping edges will regrass quickly, making banks more stable and providing better habitat for wildlife. The shallow edges of drains are productive food sources for birds and fish such as young trout and baby eels.

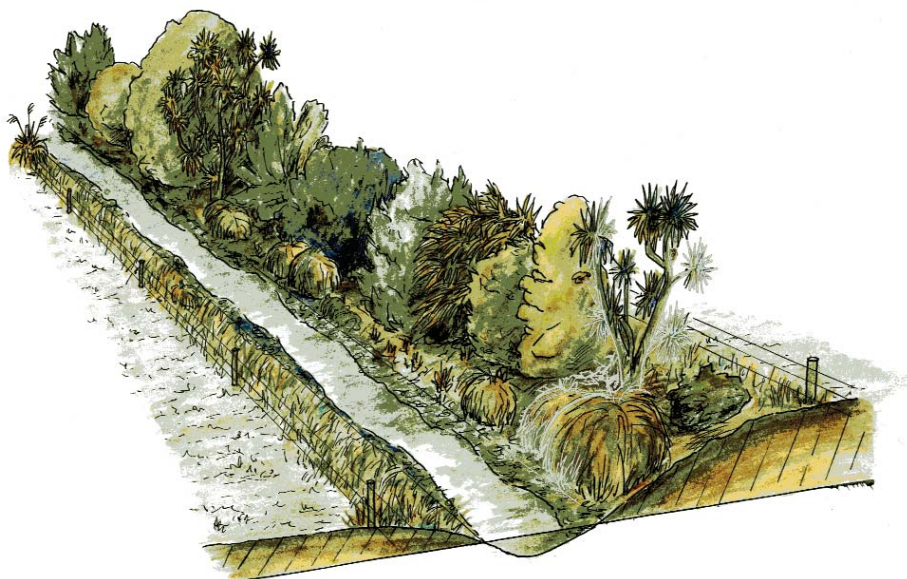


Keep drain banks less than 1:1.15 to maintain a fast flow in the center of the channel

¹⁷ Ministry for the Environment, 2001; Environment Canterbury, unpublished draft (b)

¹⁸ Environment Canterbury, unpublished draft (b).

Figure 7: A V-shaped drain provides better waterflow, less maintenance and improved habitat



Effective use of chemical spraying

Herbicide sprays are often used to control weeds in drains because sprays are cheaper than mechanical clearing. Spraying is effective but can have some damaging effects on stream life and water quality. Some sprays such as diquat and paraquat are toxic to freshwater life even at very low concentrations. Anyone using water downstream of the spraying operation may also be affected by traces of pesticide in the water, and you should be aware of who might be affected. Both Tasman District Council and Marlborough District Council do not permit the spraying of pesticides into water (although there may be some exceptions in particular circumstances).

To reduce the impacts of spraying, consider the following good management practices¹⁹:

- try to leave a strip of weed along the toe of the opposite batter
- spray at minimum effective rates more often, rather than at high concentrations and less often
- only spray the weeds that have emerged from the water at the centre of the drain where water flow is faster. This will leave the edges undisturbed to provide cover and habitat
- don't spray during peak fish spawning and migration periods. In tidal areas, only spray between October and January. In non-tidal areas, only spray between November and April
- spray ephemeral drains (seasonally wet) when they're dry
- use handgun equipment at low pressure to ensure drain bank vegetation is not damaged
- spray weeds when they're smaller to reduce the amount of dead vegetation that stays in the drain and reduce the risk of blockages
- use only herbicides that have approval for use over water
- contact your district council to check whether you need a resource consent to spray in waterways or drains.

Council drains

If you have any Marlborough or Tasman District Council drains running through your property, you'll need to make sure you manage them following the guidelines set out by the council concerned.

¹⁹ Ministry for the Environment, 2001; Environment Canterbury, unpublished draft (b).

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Contact Tasman or Marlborough District Council for help and site-specific advice about the best ways to improve your farm waterways.



A job well done!

Pulling The Threads Together

So what does all this mean for your farm? It will depend on:

- where you live in Tasman or Marlborough – soil types and environmental issues will vary
- where your farm is located within your local catchment – management needs will differ if you're in the headwaters or on the edge of an estuary down by the sea
- what you want to achieve on your farm and downstream from it
- what resources you have access to – information, advice, plants, money and time

Chances are that a combination of the four different approaches in this booklet will meet your needs. Innovation and adaptability are the hallmark of New Zealand farmers, so enjoy making the information in this booklet work to suit your special corner of Tasman or Marlborough!

Remember, you're not on your own. Farmers right across Tasman, Marlborough and New Zealand are considering how to best manage waterways on their farms, to make sure they comply with regional council rules, emerging industry guidelines and overseas consumer demands. Talk to your neighbours and exchange ideas. Attend local field days.

And don't forget to ask for help when you need it – contact either Tasman District Council or Marlborough District Council. They can provide site-specific advice and assistance about keeping streams clean in your patch.

Reaping the benefits

If you live in the Tasman District, you may be eligible for financial help with fencing and planting waterways through the Tasman District Council's River and Stream Management Fund. Contact the Tasman District Council on 543 8400 for more information.

Marlborough District Council is currently investigating options for offering financial assistance to farmers who want to fence and plant their waterways. To find out more, contact the Marlborough District Council on 03 578 5249.

There are also other organisations and grants that may be able to offer financial assistance. For information, contact Barbara Stuart at Landcare Trust on 03 5450443.

Calculate the Costs

Will you need fences?

1-wire electric (2.3mm wire, No 2 _ round posts, 8 meter spacing)	\$1.60	x	<input type="text"/>	m = \$	<input type="text"/>
Each additional wire – Electric	\$0.28	x	<input type="text"/>	m = \$	<input type="text"/>
Each additional wire – Non-electric	\$0.23	x	<input type="text"/>	m = \$	<input type="text"/>
Standard 8-wire (2.5mm wire, No. 1 round posts, 4.5 meter spacing)	\$5.60	x	<input type="text"/>	m = \$	<input type="text"/>

These prices include materials and contractor labour.

What about plants?

Conservation

Sedges and tussocks	\$2.00	x	<input type="text"/>	= \$	<input type="text"/>
Native trees and shrubs	\$3.50	x	<input type="text"/>	= \$	<input type="text"/>
Ornamental exotics	\$4.50	x	<input type="text"/>	= \$	<input type="text"/>
Poplars (1 m wands without sleeves or rostered)	\$1.40	x	<input type="text"/>	= \$	<input type="text"/>

Production – with contract labour

Pinus radiata	\$1.40	x	<input type="text"/>	= \$	<input type="text"/>
Other forestry Exotics	\$2.70	x	<input type="text"/>	= \$	<input type="text"/>
Forestry natives	\$8.30	x	<input type="text"/>	= \$	<input type="text"/>

Production – without contract labour

Pinus radiata	\$0.30	x	<input type="text"/>	= \$	<input type="text"/>
Other forestry Exotics	\$0.80	x	<input type="text"/>	= \$	<input type="text"/>
Forestry natives	\$4.70	x	<input type="text"/>	= \$	<input type="text"/>

Other costs you might need to consider

Gates	<input type="text"/>
Stock crossings (culverts and bridges)	<input type="text"/>
Earthworks for fences or stock crossings	<input type="text"/>
A new stock water supply	<input type="text"/>
Extending an existing water supply	<input type="text"/>
Labour for planting or other preparation and maintenance costs	<input type="text"/>
Consents may be needed for some activities	<input type="text"/>

Total Cost \$

Note: All prices quoted were correct at time of printing however these are susceptible to change, please use as guide only.

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