

Selwyn – Waihora

A guide to managing your drains



Sustainable Drain Management in Selwyn-Waihora

“Healthy waterways within productive land”

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This guide has been produced as part of the Sustainable Drain Management Project – a partnership led by Waihora Ellesmere Trust with assistance from local farmers, Environment Canterbury, Selwyn District Council, Ngāi Tahu and Lincoln University

This guide will be updated as we receive feedback and source further information. Please let us know if there is anything you think we have missed.

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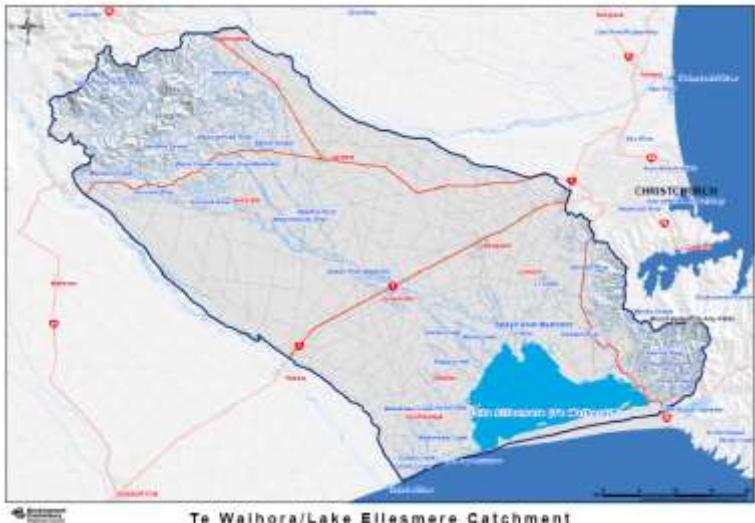
Introduction

The land surrounding Te Waihora/Lake Ellesmere has many natural springs and streams, modified waterways and constructed drainage channels. These combine to form a complex interconnected network and ultimately flow into Te Waihora/Lake Ellesmere. How this drainage network is managed has a huge impact on the water quality and habitat of the lake and tributaries.

Around the catchment, many groups and individuals have made huge efforts over recent years to improve water quality and habitat. Lots of fantastic initiatives are underway and this guide is one way to share information and experience - to encourage and support more people to play a part in enhancing the environment of the lake and surrounding areas.

This guide is for anyone who has a role in managing drains and streams around the lake – that includes farmers, those on lifestyle blocks, and the staff from the councils and other agencies who can influence how waterways are managed. We'll present an overview of some of the opportunities and point you in the right direction if you would like more detailed information on any of the topics covered here.

We're bringing together information and ideas collated over the last two years by a project team led by Waihora Ellesmere Trust (WET) with local farmers, Environment Canterbury, Selwyn District Council, Ngāi Tahu, and Lincoln University.



Te Waihora/Lake Ellesmere is the fifth largest lake in NZ and hugely significant for wildlife, fisheries and its value to Ngāi Tahu. To find out more about the lake visit www.wet.org.nz



Burnham School students planting at Coes Ford, 2011

Drainage is vital for agriculture and other land uses. The starting point for this guide is that the drainage function of the waterways must be maintained or enhanced. However, it is possible to have effective drainage and also improve water quality, biodiversity, recreation opportunities and restore some of the values of local iwi.

Read on to find out more about the drains, opportunities for improving drain management, and practical advice on how to get started.

Selwyn- Waihora drainage network

Land around the margins of Te Waihora/Lake Ellesmere is divided into several drainage schemes. Within each scheme ‘classified drains’ are managed for land drainage and, in some cases, flood protection by the district or regional council (or a committee of local landowners managing the scheme on the behalf of the council). Landowners in each drainage scheme pay a targeted rate, to either Selwyn District Council (SDC) or Environment Canterbury (ECan), to cover the costs of managing the schemes. All landowners must ensure access for drain clearing is maintained and that their activities do not cause drainage problems upstream or downstream of their land.

In total there are several thousand kilometres of classified drains, small channels which flow into the larger drains (although are dry for much of the year) and tile drains (subsurface drains) surrounding Te Waihora/Lake Ellesmere. The main focus of this guide is open drainage channels and options for improving their management.

Drains vary hugely, from the main stem of rivers such as the Halswell River, which carry significant amounts of water year round, to the shallow depressions in paddocks which channel runoff from irrigation or rain into larger drains. The way all of these drains are managed determines the water quality of downstream waterways and Te Waihora/Lake Ellesmere.



Halswell River

Much of the network of drains around Te Waihora/Lake Ellesmere is on relatively flat land. This means that the sediment and contaminants that do enter the waterways tend to settle, smothering habitats and the species that live there. Nutrients encourage excessive weed growth and maintenance of the drainage function is an ongoing challenge. There are no one-size-fits-all suggestions when it comes to managing drains, it depends on the type of drain, what you are trying to achieve, and what resources you have available.



Typical drain along a field boundary



Shallow depression channelling runoff into drain

For more information about the schemes managed by SDC see their [5Waters Activity Plan, Part 3, Te Waihora – Stormwater, Water Races, Land Drainage](#).

For more information about the Halswell scheme, including the effects of the earthquakes, see ECan’s report on [Reinstating the Halswell River after the earthquake](#).

Opportunities

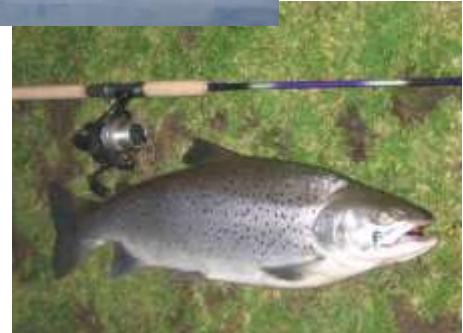
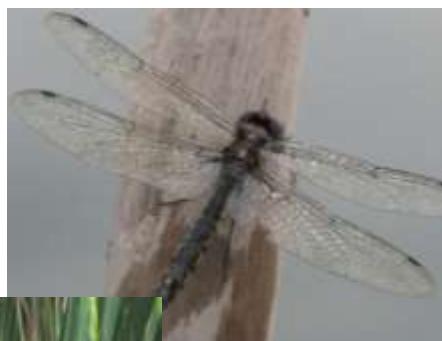
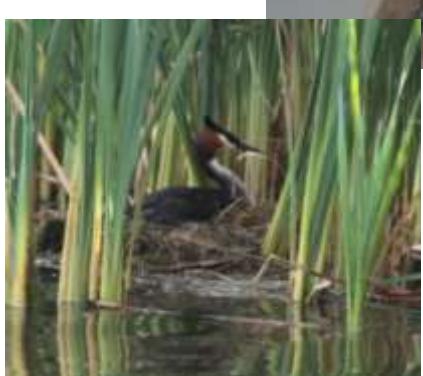
An effective and efficient drain can be much more.....

Biodiversity

Biodiversity describes the variety of all biological life – from micro-organisms to plants, animals and fungi, their genes, and the ecosystems they form. It is part of the natural heritage and unique character of where we live. Across the Canterbury Plains native biodiversity has been almost completely lost, with only a few fragments of native vegetation remaining and much habitat for our native birds and insects lost. Wetlands have been drained and waterways modified¹.

Drains are living systems and provide valuable habitat for the plants and animals that live in and near water, including a number of fish species. The riparian zones – the banks of waterways and areas surrounding springs and wetlands – can provide habitat for birds and insects and can form important corridors of biodiversity across the plains.

Encouraging native biodiversity will increase birdsong and allow beneficial insect populations to thrive.



Recreation

The larger drains – the streams and rivers of the lower catchment – and Te Waihora/Lake Ellesmere provide many opportunities for locals and visitors to enjoy a range of recreational activities. These opportunities are enhanced by a healthy natural environment and some, such as swimming and boating, depend directly on the water quality. This is determined by the inputs to the entire drainage network, not just from the adjacent land.

The lake and environs is a very popular location for waterfowl hunting and various types of fishing. Rivers and streams flowing into Te Waihora/Lake Ellesmere were once world renowned as a trout fishery but this has declined drastically over recent decades. One of the major causes of this decline is believed to be the loss of suitable spawning areas as fine sediment clogs up gravel beds of drains, streams and rivers².

Healthy waterways and thriving corridors of biodiversity add to the enjoyment for the thousands of people who walk, cycle, picnic, fish and hunt around the lake and tributaries.

¹

<http://ecan.govt.nz/publications/Plans/BiodiversityStrategyFinalFeb08.pdf>

² <http://www.wet.org.nz/wp-content/uploads/2009/10/Ch06-Brown-trout-fishery.pdf>



Amenity

Clean water and diverse native riparian habitats can contribute to people's general enjoyment and appreciation of an area where they live, work or play. Many people believe that land sells more readily and property values will be increased by fencing and planting riparian areas³.

Ngāi Tahu

Māori occupation around Te Waihora and ensuing Ngāi Tahu settlement has positioned Te Waihora as a significant part of the iwi's heritage. To Ngāi Tahu Whānui, Te Waihora represents a major mahinga kai and an important source of mana. Te Kete Ika a Rākaihautū – The Fish Basket of Rākaihautū – is the original name for the lake. Clean water and the healthy plants and animals of the lake and tributaries are necessary for the customary gathering of food and natural materials. Maintaining customary use and access is of great importance to Ngāi Tahu.

Ki uta ki tai - from the mountains to the sea – is central to Ngāi Tahu resource management philosophy. It is a way of understanding the natural environment, including how it functions, how people relate to it and how it can be looked after appropriately



By considering the opportunities available, and actively managing to enhance drains and their margins, good stewardship of the land and other resources is demonstrated – making a difference for today, and also for future generations.

³ Report on Soil Conservation and Waterway Protection in Middle Waikato, Environment Waikato 2005.
<http://www.waikatoregion.govt.nz/PageFiles/3364/tr05-14.pdf>

The drainage network – common issues, possible solutions

Water Quality

The cumulative impacts of land use adjacent to the drainage network over many years has resulted in poor water quality in Te Waihora/Lake Ellesmere and in the drains, stream and rivers that flow into it. High levels of nutrients such as nitrogen (N) and phosphorus (P) contribute to occasional algal blooms and affect the flora and fauna. Microbial contaminants from stock, indicated by the presence of *E. coli*, have made many swimming spots unsafe. Nutrients and contaminants can enter the drainage network through surface run off and stock access to parts of the system.

Where stock are in or near the water there will be increased faecal contamination and raised nitrogen levels. Sediment is the main source of phosphorus in the waterways. Although some of this sediment is a result of natural processes, particularly near the Port Hills, run off from pastures and erosion in and around waterways are also major contributors. Smaller drains, channels, low points and gullies, are often overlooked but, when considered in relation to the whole network, can have the greatest impact on water quality⁴. Smaller channels are often unfenced, allowing sediments and other contaminants to move freely into the larger drains.

Possible solutions



Fencing of all waterways, including the smaller side drains and low areas that drain into larger waterways can drastically reduce the

inputs of sediment and other contaminants. Where possible, focusing on the smaller side drains is recommended as this will have the greatest influence on downstream waterway health.

⁴

http://www.biol.canterbury.ac.nz/ferg/MacKenzie%20project/PDF/Handouts/Riparian_management.pdf



Establishing buffers of appropriate vegetation along waterways and around wet areas will intercept surface runoff which slows water movement allowing sediment to drop out. This will reduce the amount of sediment, and therefore phosphorous, getting into drainage channels and will also provide some shade. Any planting needs to be well designed to maximise effectiveness. Where smaller channels, depressions or gullies are discharging to drains, consider constructing small wetlands to slow water flow, remove sediment and improve water quality. These can be designed to accommodate travelling irrigators if necessary.

Excessive weed growth and build-up of sediment



Some weed growth will provide food and habitat for fish and other species but excessive growth of species such as monkey musk (*Mimulus guttatus*) causes problems. Where there is no shade, invasive

water weeds thrive and water temperature rises, leading to lower oxygen levels and damaging habitat for fish and invertebrates. Weeds can trap sediment and reduce the capacity of the drainage system at times of peak flow.

Possible solutions



Creating shade, particularly at the point where the water meets the stream bank, can reduce germination of weeds and the amount of weed growth across the channel. Planting with suitable species, such as sedges which overhang the water (*Carex secta*), and planting on the northern bank to maximise shade, can reduce weed growth and the need for regular cleaning. The aim is not to shade out all water weeds, as they provide habitat for many species, but to reduce the areas of excessive growth. A well designed buffer of vegetation will also reduce the amount of sediment reaching the drain, further reducing the need to clean.

Habitat loss and disturbance



Many drains with year round flows are cleaned every year with an excavator to remove weeds and sediment build up to ensure water continues to flow freely, reducing the risk of flooding. Regular disturbance of the channel damages habitat, disturbs nesting birds, and destroys areas where fish feed and spawn. Dislodging of fine sediment causes downstream problems and destroys spawning areas for native fish and trout. Eels and other species can be dragged out by the machinery and left stranded on the banks.

Possible solutions

If drains need to be cleaned would low impact methods work? For smaller drains walking up the channel in waders may be enough to create a fast flowing zone in the centre of the channel. Consider cutting weeds by hand and remember to remove any cut vegetation as, if left, it will rot and reduce oxygen levels in the water.



Riffles are important habitats for stream life

- They are the raised gravel ridges in a streambed or drain, often occurring about six or seven channel widths apart.
- Riffles are the preferred habitat of many species of fish and insects. Trout lay their eggs in riffles from May and June onwards.

- The female trout stirs up the gravel, causing material to be washed downstream and leaving a clean, well-oxygenated gravel bed for the eggs. Any sediment deposition caused by drain clearing at the time will re-block the spaces around the gravel, cut oxygen supplies and reduce the chances of the eggs' survival.
- Elvers (baby eels) also live in the riffles, staying there until September or October.

If using machinery, inspect the drain with the operator before cleaning to identify any features such as riffles or habitat of threatened species like Canterbury mudfish (*Neochanna burrowsius*) which should be protected. Make sure the operator is aware of any planting that has been carried out on drain banks.



Careful clearing of a narrow channel can minimise disturbance to the banks and using an excavator with a weed rake or stream cleaning bucket will allow water and organisms to escape back into the waterway.

In some drains, creating a sediment trap could be a helpful option. An area can be excavated where sediment will collect. This will need to be cleaned out periodically, but will cause less disturbance to habitat than cleaning a long stretch of the drain.

Think about the timing of work on drains to minimise impact on birds and fish. In smaller drains and those which are some distance from the lake only use excavators between November and April. This avoids disturbance of trout spawning (May – October) and also reduces disturbance to elvers (baby eels) that live in the gravels until September or October. In the lower reaches of any drains flowing into Te Waihora/Lake Ellesmere there may be inanga (whitebait) spawning in February and March and so there it is advisable to avoid any disturbance from February right through to November, only cleaning drains in December and January.

Loss of bank stability

Where drain banks erode or slump, large amounts of sediment can enter the system, affecting water



quality and contributing to lower capacity at times of peak flow. There are a number of things that can affect stability.

- Repeated cleaning can widen and deepen channels, slowing water movement which in turn can lead to more sediment deposition and weed growth.
- If banks are undercut, the loss of stability can lead to erosion and further sediment entering the waterways.
- Spraying of vegetation on drain banks can cause a loss of stability as the plant roots which bind the soil break down.

Possible solutions

It's important to take care with machinery and avoid over widening, deepening and undercutting of banks. A V-shaped channel will help bank stability and the establishment of vegetation. This will also create faster water flow in the centre of the channel which will reduce weed growth. Rebattering or reshaping of the banks can increase the flood capacity in times of peak flow and provide a great environment for establishing a buffer of vegetation.



Planting of drain banks can stabilise the bank and add biodiversity and shade. Where possible, use species native to the area and ensure the right plants are planted in the right place. Good planting can (particularly if it is on the northern bank of a drain) reduce the establishment and growth of invasive weeds which germinate and thrive in sunlight. This is one way of reducing the need to regularly clean a drain and will lessen the impact on the environment and also reduce the cost of drain maintenance.

Willows

The introduced grey willow (*Salix cinerea*) and crack willow (*Salix fragilis*) are common throughout the

catchment, and were often planted to stabilise stream and river banks. They can grow vigorously and spread, causing blockages, flooding and, in dry periods, draw up water and reduce the flows in waterways. Grey willow in particular is a problem for any existing native habitat as it can quickly invade and completely change the environment.

Possible solutions

Removing willows is generally the best long term option around lowland drains. Get advice on willow removal, particularly for the larger trees – they can be dangerous to fell. Stumps should be left in place to prevent bank erosion.



Grey willowcatkins – female above, male on the right



To summarise

issues	Solutions
Water quality	Exclude stock, plant buffers and construct small wetland areas in the low points and gullies
Excessive weed growth and build-up of sediment	Careful cleaning - see suggestions above Planting drain banks to create shade and intercept sediment
Habitat disturbance	Low impact cleaning by hand Identify and protect areas of high value Use a weed rake Carry out work in December and January (November – April if well away from the lake)
Loss of bank stability	Create a V shaped channel, plant banks
Willows	Remove, leaving stumps in place

Managing your drains

Before you start on any projects there are a few simple things to consider. Find out if you will need approval from the district or regional council. They are generally supportive of improvements to drain profiles and appropriate planting, but may have advice on how to proceed.

Prepare a plan – begin by doing a stocktake of the drains you are managing and identifying your objectives



It is a good idea to start off with what you know – what are the characteristics, including the likely peak flows, of your drains and how are they being managed now? What area of land is being drained, what is the land use, and are there opportunities to make changes? Is there a particular problem, or problems, you are trying to address and, if so, do you know what is causing or contributing to the problem?

Prioritise any work you are planning.



It's fine to tackle a project in stages over a few years. Consider starting with the smaller drains and low spots that discharge the most sediment and runoff to the bigger drains – this will make the biggest difference to water quality in the drainage system.

Get landowner permission, any consents/approvals required and know what rules apply

Ownership

Ownership of drains and land beside them, particularly along roads, can be tricky to determine. Check with the council where boundaries are and, if you are planning any work such as fencing or planting on drains or drain banks, check the landowners are happy with it.

Consent or Approval

For some activities, such as willow clearance that disturbs the streambed, installing a culvert, changing the course of the waterway, or creating ponds, you may require resource consent. Contact the ECan Customer Service team on 0800 324 636 for advice.

If the drain is a classified drain or part of a flood control scheme you may need approval from the

Two overlapping application forms for land drainage planning. The top form is titled 'Land Drainage Application Form - New or Minor Works' and the bottom form is titled 'Application Form - Land Drainage Planning Adjacent to a Classified Drain'. Both forms contain detailed sections for landowner information, drainage details, and planning applications, with various checkboxes and dropdown menus.

district or regional council for any work, including planting of grasses, trees and shrubs.

If your drains are managed by ECan, the [Flood Protection and Drainage Bylaw 2013](#) is now operative and written authority may be required before you carry out work in or within 7.5 metres of the waterway. If you are planning to plant, widen, fence or do any other work in or near a drain contact the ECan Customer Service team or email: floodbylaw@ecan.govt.nz to find out if you require an authority - there is currently no fee for this. Similarly, SDC have a process for granting approval for work around the drains they manage. Ring 03 347 2800 for details.

Plan Rules

Find out if there are any local plan rules which apply to your drains. For example, many drains will need to comply with the regional council's stock exclusion rules from the proposed Land and Water Regional Plan. If the drain is a natural waterway or a modified natural waterway (or flows into a natural waterway) then all intensively farmed livestock are completely prohibited from entering it. All heavy stock are also prohibited from entering water near specific swimming sites, inanga (whitebait) spawning sites, and upstream of community drinking water supplies.



Rules prohibiting discharge of contaminants apply to all waterways, whether natural, modified or artificial. Runoff into drains should not produce any objectionable odours, adversely affect aquatic life, make the water unsafe for farm animals to drink, or result in high levels of faecal contaminants.

Rules may be updated as a result of ongoing planning work so it is advisable to check with ECan and SDC to find out how the rules apply to you.

Plant to enhance drainage

The right plants in the right place can help to address a range of issues including improving water quality, drainage function, biodiversity and amenity. The next section will help you get started.



Healthy, well vegetated riparian margins help to:

- *Improve water quality by providing a buffer to trap sediment and contaminants*
- *Reduce the need for drain clearing*
- *Improve the habitat for aquatic life*
- *Bring back the birds and other wildlife*
- *Reduce bank erosion*
- *Make waterways more attractive and demonstrate good stewardship*

Riparian Restoration – step by step to successful planting

Creating a buffer of vegetation along a drain bank, or a small wetland area where drains, depressions or gullies channel water into larger drains, can produce multiple benefits. Any well established vegetation, such as rank grass, will intercept sediment and other contaminants and contribute to improving water quality. However, planting with native plants can produce many other benefits, including creating shade which will, over time, reduce the weed growth and the need to clean the drain. A diverse planting of natives will contribute to biodiversity and create a range of benefits, both for the farm and for the wider environment.

Riparian planting - how to get started

There are various ways to approach riparian planting projects and learning from some of the work undertaken over recent years can improve your chances of successful plant growth and a high survival rate. Investing in good advice and proven practices will deliver long term benefits.

Once you have identified your goals and made sure any consents or approvals have been obtained there are some general principles which can be applied to the majority of planting projects.

Fencing and access

If you are undertaking a planting project you will need to exclude stock from the planted area. A permanent fence is preferable as stock can do a lot of damage in a very short time if they gain access to a newly planted area. You will also need to allow a metre or so from the fence line to the plants to prevent stock reaching through and grazing on the seedlings. Providing an alternative drinking water supply for stock may also be necessary – the costs of this are likely to be offset by improved stock health and productivity.

Remember to maintain access as occasional cleaning may still be necessary, particularly in the first few years after planting.

Reshaping the banks



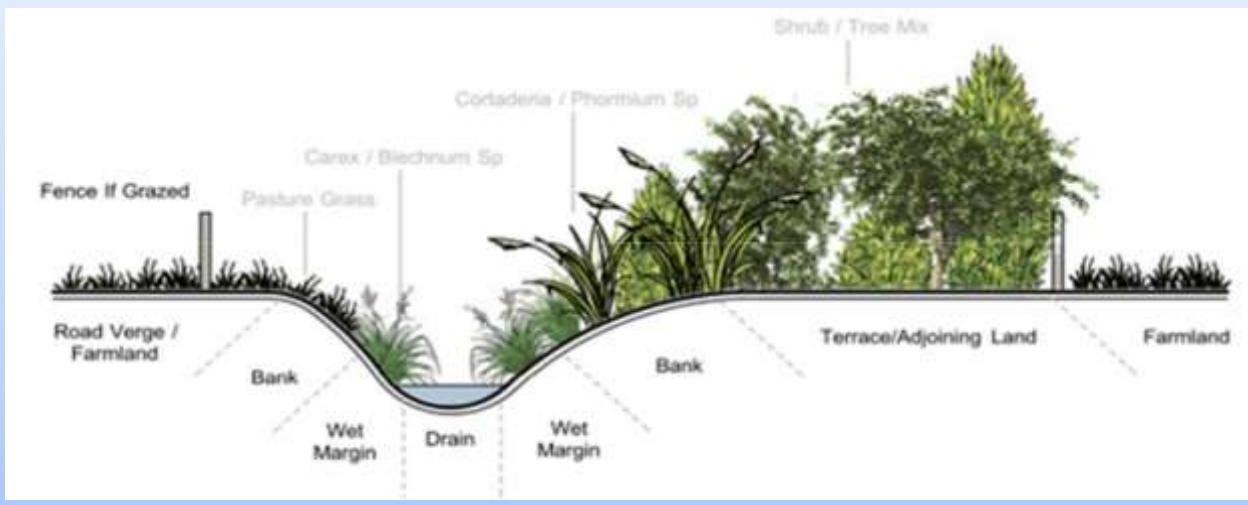
You may need to consider reshaping the banks before you start to create a good environment for planting. Creating a V-shaped profile can increase the efficiency of the drain and will ensure that planting causes no net loss of capacity. Aim for a slope of 1:1 or 45 degrees. If it is a classified drain you will need to discuss this with the council drainage engineers.

What species will be suitable?

- Environment Canterbury – [Choosing the right plants](#)
- Selwyn District Council – [Drainage planting and design](#)
- Department of Conservation - [Plant communities of the Canterbury Plains](#)
- Crop and Food Research - [Natives to encourage diversity of pollinators](#)

What to plant?

It helps to know a bit about the soils, the plants already growing on site, and how wet the area gets. This will help you select suitable plants for the site. Ask a restoration expert or your local council for advice if you're not sure.



Think about the different zones on your site. The areas nearest the water, the wet margins and the drain banks which may be subject to occasional flood flows, will need different plants to those on the drier terraces. All plants, even those suitable for the wet edges of drains, should be planted well above the typical water levels to ensure that flood flows can pass freely. Avoid planting anything that could cause a blockage too close to the water's edge. Even flax plants, as they grow, can cause problems if planted too near the water.

If you need to maintain access for cleaning then one option is to plant a row of low growing plants such as *Carex secta* along the wet margin. An excavator can reach over these plants if cleaning is required.

For the terrace areas, a suggested approach is to select a range of plant species that would naturally occur in groundcover or understorey, sub canopy and canopy and distribute them evenly across the site. Plant seedlings should be spaced at 1.5m distance apart (each plant occupies 2.25m²) which gives a plant density of 4500 plants per hectare.

ECan, SDC the Department of Conservation all have information available on suitable species, or you may be able to get advice from a local nursery. Other specialised lists are available such as one listing natives which encourage pollinator diversity.

Width of riparian planting

The ideal width of the area planted will depend on what you are trying to achieve and what resources you have available. If the main aim is to provide shade to the water, then for smaller channels relatively narrow plantings of grasses and sedges will be sufficient. For larger drains, taller shrubs and trees (and time for them to mature) will be required. For maximum benefits a width of 10m+ on either side of a waterway has been recommended⁵ but this may not always be practical in a working landscape. A narrow strip of riparian planting will be less self-sustaining than a larger area and may be more subject to weed invasion but even a narrow buffer will make a great contribution to local biodiversity and help to improve some aspects of water quality⁶.

understorey	grasses, flax and small shrubs,	40%
subcanopy	Small trees and large shrubs	45%
canopy	Large tree species	15%

⁵ Parkyn et al. (2000).

<http://www.arc.govt.nz/albany/fms/main/Documents/Plans/Technical%20publications/301-350/TP350%20Review%20of%20Information%20on%20Riparian%20Buffer%20Widths%20Necessary%20to%20Support%20Sustainable%20Vegetation%20and%20Meet%20Aquatic%20Functions.pdf>.

⁶ Parkyn & Davies-Colley (2003)

<http://www.niwa.co.nz/sites/default/files/import/attachments/riparian.pdf>

Seedling Orders

Suitable restoration grade seedlings, which have been grown from seed collected from plants naturally growing in the district, should be pre-ordered. Nurseries may have stocks of suitable plants available but if not they will need time to collect and grow the seed so up to 18 months notice is helpful. Using the right plants, sometimes known as eco-sourcing, will ensure that you get plants adapted to the local conditions.

Site preparation



Start with a weed free site as weeds will compete for any available soil moisture and will reduce the chances of survival of newly planted seedlings. It is easier to control weeds prior to planting and herbicides are an effective means of achieving a weed free planting site. Depending on the cover, you may need to spray more than once so you'll need plenty of lead in time before planting. Spot spraying should be used along the lower lying wetter areas to ensure bank stability is not compromised. More elevated drier areas can be completely cleared of weeds before planting.

Seedling Establishment

Planting in early spring once most of the winter frosts have passed is recommended, although autumn planting is also fine in more sheltered areas.

Planting work can be carried out by contractors or staff, by volunteer groups, or by family and friends. However you choose to plant, ensure the planting hole is big enough for the root ball and once



planted make sure the soil is replaced and firmed down to eliminate any air pockets. Adding a slow release fertiliser tablet (20 grams) into the planting hole will greatly improve the growth and performance of the seedling. Using some form of plant protection, such as a mulch mat and plastic sleeve, will also help performance and make maintenance much easier.

Herbicide can be used to keep the areas around the plants clear of weeds and a plastic sleeve protects the young plants from the spray. *Carex* species can be planted without a protective sleeve as weeds around them can be effectively controlled by selective herbicides.

Maintenance

After planting, the focus is on providing the developing seedlings with adequate soil moisture levels. Where the soil is wetter, the areas immediately around the plants can be spot sprayed so that some vegetation is retained to ensure bank stability and provide some buffer to intercept sediment while plants are becoming established. In the drier areas the priority is to control weed growth around the seedlings to prevent them from being smothered and to prevent the soil moisture being lost - total weed control is recommended. Around four to six release sprays will be needed each year for the first two to three years.

After two to three years the plants should be well established and the need to remove weeds will be reduced. The plastic sleeves can be removed at this time. It is generally more efficient to remove all the sleeves from a site at the same time as it is less likely that some will be overlooked. If they slide off it may be possible to reuse some of the sleeves.

As the plants become established there may also be damage from pests such as rabbits, hares and pukeko. Using plastic sleeves will protect plants to some extent but pest control may also be required in some areas.

If any plants do not survive in the first year or two it is advisable to replace them. After the first few years the plants should be well grown and able to out-

compete most weeds, although some ongoing weed control will be needed to keep on top of weeds which may be blown into the area or carried by water or birds. As the plants become established and produce fruit and seed, insects and birds will be encouraged to feed and natural regeneration can be expected.

Following the steps outlined above requires commitment for the first few years but will protect your investment and should result in plant survival of 95% or more.

Herbicides

Make sure that you have the right herbicide for the job, you are familiar with the safety data, and you have the right equipment and protective gear.

You can get more information about herbicides from the regional council (ECan Customer Service team, 0800 324 636) or visit the [Department of Conservation website](#).

There are other approaches to restoration planting, such as using hand weeding rather than chemicals, but these are not covered in this guide.

Small wetlands

Small wetland areas around a depression or a gully, or around a spring, can have significant benefits for water quality and biodiversity. If you have tile drains, constructed wetlands to intercept the flow before it discharges to open water are worth considering. For a small wetland area the same principles apply as with a riparian strip - the site needs good preparation, planting and maintenance. The species mix can be adjusted to accommodate an irrigator and to tolerate periodic inundation by water. NIWA has produced a very [useful guide](#) to constructing small wetlands.

Monitoring your progress

Have you achieved your goals? Have there been any surprises along the way? Keeping a record of your

project, your successes and any problems you encounter, will be very useful, both for your own use if you decide to extend your restoration project, and for others. Keep a record of work undertaken, dates, which plants have been installed, and take regular photos from the same spot so you can track progress. If you are interested in ongoing monitoring of water quality and biodiversity contact local councils or community groups who may be able to help you set up a monitoring programme.

Indicative costs for a riparian planting project

Costs for a project will vary considerably depending on what you are starting off with and what you are trying to achieve.

You will need to discuss any earthworks (bank reshaping) with a contractor as the costs will depend on access, how much material is to be moved, and if it is to be removed from site. Fencing costs will also vary, depending on what type of fencing you use. A temporary fence to exclude stock may be sufficient in some cases, and relatively low cost, but a permanent post and wire fence will provide better protection for the plants if there are stock nearby.

You will need to consider the costs of site preparation, seedling purchase, other resources for planting such fertiliser tabs and protective sleeves/mulch mats, and the cost of labour to undertake the planting. An indicative cost (2013 prices) for a project with 1000 restoration grade plants would be:

- Site preparation and plant establishment – approximately \$6000 (+gst), with around half this cost made up of plants and resources and half of labour.
- Maintenance of 1000 plants for 2 years - approximately \$4,000 (+gst), with around \$1,000 for the resources (spray) and the remainder for labour.

The estimated labour component of a project involving the planting of 1000 plants is 20 – 30 days spread over the first two years. This is around 60% of the total cost so any labour you provide yourself will be reflected in the costs.

Costs and benefits of improved drain management and riparian planting

If you've made the decision to look at how you are managing your drains and to undertake a riparian planting project or to create a wetland, what are the costs and benefits you can expect over time?

Costs

Any consideration of costs and benefits should take into account the current drain management regime and associated costs, such as regular cleaning and weed control. If there is a fence already in place, or one is required by planning rules, then there will be no additional fencing costs from a planting project. Indicative costs for planting and initial maintenance are above.

In general, some of the costs which may apply include:

- *Compliance costs/consent fees if required*
- *Professional advice*
- *Reshaping of the drain banks*
- *Fencing, and any subsequent maintenance of the fence*
- *Provision of alternative stock drinking water source*
- *Loss of productive land¹*
- *Site preparation and planting*
- *Replacement plants (blanking)*
- *Pest control and initial maintenance (weed control)*
- *Ongoing long term maintenance (a wider/larger area of native planting will need less ongoing maintenance)*



Benefits

Benefits are not always easy to identify and may take several years to be realised. They can be local benefits - on the farm and/or contributing to the productivity of the farm - or they may be benefits occurring downstream of the farm, in the wider environment, and benefits to the wider community. Many benefits can be considered ecosystem services⁷.

Some potential benefits which may apply include:

- *The district council may consider rates relief for land retired from production*
- *Reducing drain channel maintenance costs as weed growth reduces (as a result of shade)*
- *Improving drainage as a result of less weed growth*
- *Reducing the likelihood of flood damage as flood capacity increased*
- *Keeping stock out of water and riparian zones will reduce faecal contamination of water and erosion of the banks*
- *A buffer of vegetation will slow overland flows, reducing erosion and scouring of channels*
- *Less fine sediment in the stream, leading to clear gravel beds which are good for fish spawning*
- *Reducing nutrients entering waterways, particularly phosphorus which is carried by sediment (this will be beneficial where a reduction in nutrient discharges is required)*
- *Water filtration and nutrient cycling*
- *Controlling and replacing areas of gorse which, as a nitrogen fixer, can add nitrogen to the system*
- *Removing willows will have long term benefits, improving the efficiency of drainage systems*
- *Increased shading of the water, leading to improved stream health (indicated by healthy invertebrate populations) and water quality (lower temperatures, dissolved O₂ levels)*
- *Enhancing values for Ngāi Tahu and improving mahinga kai*
- *Increasing biodiversity and improved connectivity between areas of high habitat value*
- *Creating corridors of native plants can provide stepping stones for wildlife to colonise new areas¹*
- *Improving habitat for fish and invertebrates, with the addition of leaf litter/woody debris as a food source*
- *Improving habitat for spawning fish and nesting birds*
- *Bringing birdsong back to the plains*
- *Providing habitat to encourage honeybees and native pollinators - [studies have shown](#) that yields can be higher when there are a diverse range of pollinators*
- *Creating areas for potential cropping, e.g., timber or flax*
- *Increasing opportunities for food gathering, e.g., watercress from unpolluted waterways, fishing, waterfowl hunting*

⁷ Ecosystem services are the benefits people obtain from ecosystems. These include provisioning services such as food and water; regulating services such as flood and disease control; cultural services such as spiritual, recreational, and cultural benefits; and supporting services, such as nutrient cycling, that maintain the conditions for life on Earth. *Ecosystems and Human Well-being A Framework for Assessment, Chapter 2 Millennium Ecosystem Assessment* <http://www.unep.org/maweb/documents/document.300.aspx.pdf>

Benefits continued:

- Providing wind breaks/shelter will increase local humidity and can improve the microclimate in the vicinity of a drain
- Wind breaks and partial shade of pasture reducing moisture loss and reducing the need for irrigation
- Providing shelter can improve dry matter production on adjacent land
- Providing shelter can protect stock from temperature extremes and wind stress
- Fencing waterways can aid stock security, making it easier to locate and herd stock
- Keeping stock out of water can improve stock health and productivity
- Enhancing aesthetic appeal, amenity values and how an area looks. This can add to or create a sense of identity
- Improving amenity value and potentially property values. Improvements to drains are often on property boundaries so can be very visible
- Creating a positive impression of an area, which can assist in promoting and marketing produce from the area
- Enhancing cultural and spiritual values
- Creating or improving opportunities for recreation. This may include new ecotourism ventures which can bring income to a region
- Creating areas with potential education and research value
- Giving a sense of personal legacy and of making a contribution to the community
- Unknown future benefits to humans.....

How the costs and benefits apply to a particular project will vary considerably, but there is a growing body of research which considers the effects of riparian restoration and the contribution of ecosystem services. More information is available on the WET website – look for the [Sustainable Drain Management page](#) under projects.



*Planting at Coes Ford Reserve, September 2011,
and the same site 18 months later.*



Further information

There is further information on the [WET website](#) and many other sources of information about specific aspects of drain management. You can also download our brochure with information about demonstration sites you can visit.

Visit www.wet.org.nz
for further information

Both [Selwyn District Council](#) and [Environment Canterbury](#) provide information about drain management:

Getting expert assistance with the planning of a project can save time and money. There are a number of local consultants, or council staff may be able to provide some technical expertise. There may also be some funding available to assist landowners undertaking projects, particularly those which enhance biodiversity. Contact your [Selwyn District Council](#) or [Environment Canterbury](#) for more information on funding assistance.

There are other programmes which may be able to provide assistance, such as the Living Water partnership (Department of Conservation and Fonterra) or the [Whakaora Te Waihora programme](#). Contact WET for suggestions about where to find the help you need.

Be flexible with your approach to drain management and riparian restoration – you will learn as you go what works well for you and may need to adapt to get the best results. Your experiences will be valuable for others too - share your successes and what you've learned along the way where you can.

Glossary

Blanking	replacing plants which have failed to thrive
Classified drain	a drain which the district or regional council is responsible for managing
ecosystem services	the benefits people obtain from ecosystems (see p. 16 for a fuller definition)
Mahinga kai	Ngāi Tahu interests in traditional food and other natural resources and the places where those resources are obtained.
Rebattering	reshaping the banks of a waterway
Riparian	the area adjacent to a waterway (including drains) or wetland
Selective herbicide	target unwanted plants while leaving the desired plant e.g., <i>C. secta</i> , unharmed-

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Photography: -

WET – photos on p. 1

Peter Langlands – photos on p. 3

Stephen Brailsford – photos at bottom of p. 7 and on p. 17

All other photos and catchment map supplied by Environment Canterbury

Drain profile diagram courtesy of Selwyn District Council



Our key messages

Good management, including riparian planting, can deliver other benefits such as improved water quality and biodiversity, and less growth of invasive water weeds – a win win!

- For drains, make sure the drainage function is maintained or enhanced. This means thinking about access for drain clearing and avoiding planting anything that could impede flows
- Keep stock out of the water – this will protect banks and stop contaminants getting into the water
- When improving drains, start with the smaller drains and the ‘hotspots’ – any low points or gullies that channel runoff to the larger drains during wet periods
- Have some vegetation to trap and filter sediment and nutrients – rank grass can be effective, but mixed native grasses, shrubs and trees can be a great option
- The ideal width/area of vegetation will depend on the situation, but for a wider drain that carries water year round allow enough space for some taller species on at least one side if possible
- Shade from taller growing species, especially on the north side, will help prevent weed growth in the drain (and minimise the need for maintenance) and improve water quality
- Choose plants carefully – the right natives will grow well and encourage biodiversity back to the plains
- When maintaining your drains avoid spraying the banks, overwidening, or causing excessive disturbance to the streambed which damages the habitat. Think about where the spoil goes and make sure contractors know about any riparian planting
- Ask for advice! Talk to your local drainage engineers to make sure they are happy with your plans and ask an expert for advice about which plants to choose and how to place them.

Planting Project Worksheet

Project Name

Project objectives

1) _____

2) _____

3) _____

Landowner permission?

Checked/received
Consents or approvals?

Resources available

Labour, tech support/advice, funding

Reshaping drain profile

yes/no

Details:

New fencing required

yes/no

Details:

Pre-ordering of plants

Name of supplier:

Number of plants ordered:

Date ordered/reference:

Site Preparation *Resources needed – spray/equipment, labour*

Details of what is required: Key dates:

Planting *Resources needed – plants, fert tabs, protective sleeves/mulch mat, labour and equipment*

Who is planting: Key dates:

Maintenance/Monitoring *Resources needed – spray/equipment, labour, camera*

Who is doing the work: Key dates:

Notes

