



A beginner's guide to wetland restoration

Quality for Life



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Environment



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Wetland wise

What is a wetland?

The term 'wetland' covers habitats where the land is covered in, or saturated by, water for most (but not necessarily all) of the time.

Wetlands occur in areas where surface water collects or where underground water seeps through to the surface. They include swamps, bogs, salt marshes, lakes and some river edges.



Lake Kohangatera,
Pencarrow

Why wetlands are important

Wetlands were once considered useless wastelands or potential pasture. Today, we recognise that they are important and hugely diverse ecosystems – and that conserving and restoring them benefits not only wetland species, but also many other aspects of our environment and way of life.

A giant 'sponge'

Wetlands act as a giant sponge, helping to control water flow and water quality. Their plants slow the flow of water off the land so that, in times of flood, more can be absorbed into the soil. In summer, stored water is slowly released from wetlands, maintaining water flows.

A filter

Bacteria in wetlands' damp soils contribute to cleaner water by absorbing and breaking down about 90% of the nitrogen contained in farm run-off (such as in fertilisers, chemicals and animal wastes). This cleaner water prevents nuisance algal blooms and is better for stock. Plants also trap waterborne sediment, preventing silt entering streams and harbours.

A food source

Wetlands are the most productive places on Earth, providing an enormous food source for fish, birds and other animals. They absorb large amounts of water and nutrients from outside sources, and their micro-organisms (fungi and bacteria) efficiently decompose and recycle nutrients.

A cultural treasure

Wetlands are important to Maori, featuring in the history and culture of many hapu. Wetland plants are traditional materials for clothing, mats, medicine and dyes. Wetland animals, especially tuna (eels) are valuable food sources.

Wetland types in the Wellington region

The Wellington region has four main types of wetlands:

- bogs
- coastal wetlands
- swamps
- lakes and ponds.



Bogs

Bogs are rare and precious in the Wellington region. Fed only by rainfall, they are low in fertility and are acidic. They are home to a variety of specialist plant life, with the wettest dominated by sphagnum moss. Drier bogs support a variety of plants including sedges, rushes, umbrella ferns and manuka.



Coastal wetlands

Estuaries (including salt marshes) are the most productive of all wetlands, and especially rich in animal life. Many coastal fisheries depend on estuaries as fish spawning grounds.



Swamps

Most wetlands on private land are swamps. They are more fertile than bogs because the water flowing through them brings silt and organic matter. Swamp water levels fluctuate seasonally.

Typical swamp plants include raupo, purei and harakeke (flax). The organic matter these plants produce encourages large populations of aquatic invertebrates including insects, water-snails, crustaceans and worms, and vertebrates like frogs and birds.



Lakes and ponds

Lakes are permanent areas of fresh water. Open water areas with shallow margins surrounded by swamp vegetation provide important water fowl habitat. Of the significant number of lakes in the Wellington Region, the largest is Lake Wairarapa.

Unique wetland wildlife

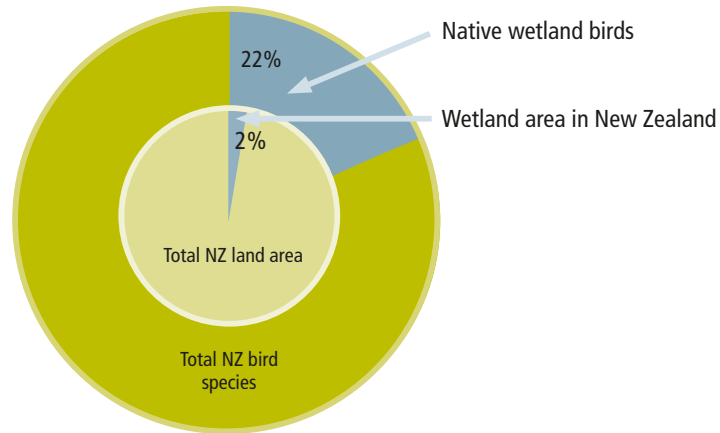
Wetlands support an immense variety of animals, some of which are very rare.

Indeed, most of New Zealand's wetland animals are not found anywhere else in the world. They include fernbirds, New Zealand dabchicks and scaup, shoveler, and paradise shelducks. Mudfish are also unique.



Large native dragonfly

Animals that can only live in wetlands face an uncertain future through habitat loss and/or damage. Many, like the bittern and short-jawed kokopu, are now endangered. Conservation and restoration programmes provide the habitat these creatures need and ensure our wildlife survives into the future.



Wetlands now cover less than 2% of New Zealand's land area, but are home to 22% of our native land bird species.

Wetland birds

The bigger and more diverse your wetland and those in your area, the more diverse your birdlife will be. The table on the following page shows the kinds of habitat wetland birds need.



Spotless crane among raupo

	Bird	Habitat requirements
	<p>Spotless crane, marsh crane and bittern</p>	<p>These secretive birds feed in permanently shallow water under cover of dense raupo or flax. They build nests under sheltering sedges among stands of manuka.</p>
	<p>Fernbird</p>	<p>Fernbirds prefer wetlands with dense ground cover under a selection of shrubs and small trees like manuka. Fernbird are rare in the Wellington Region.</p>
	<p>Pied stilt</p>	<p>Pied stilts feed on worms and insects in temporary winter pools in paddocks, and nest in scattered clumps of rushes.</p>
	<p>Scaup</p>	<p>Scaup prefer deep, open and clear water.</p>
	<p>Mallard, grey duck, shoveler and grey teal</p>	<p>These birds prefer shallow water around the edges of a pond or lake. They need open water to moult in safety, away from predators.</p>
	<p>Dabchick</p>	<p>Dabchicks feed in deep, open water but build their nests on floating rafts of vegetation among reeds.</p>
	<p>Tui, waxeye, bellbirds, and kereru</p>	<p>These birds visit wetlands at certain times to feed. Tui, waxeye and bellbird feed on harakeke (flax). Kereru (wood pigeons) visit wetlands to feed on kahikatea fruit.</p>

Focus on fish

Many of New Zealand's native freshwater fish live in wetlands for some or all of their lives – such as short and long-finned eels, inanga, giant kokopu and banded kokopu.

These fish also journey to and from the sea using a corridor of rivers, streams and drains.

This watery pathway must be kept intact if they are to complete their lifecycles successfully.

In contrast, the endangered brown mudfish spends all its life in wetlands or in drains or weed-filled creek beds. During dry spells it has an extraordinary ability to burrow deep into mud or under logs and hibernate for months at a time. This means it can occupy seasonal wetlands not accessible to other fish.



Banded kokopu (left)
and eels (right)

Whitebait

The juveniles of five of our native fish – banded, giant and short-jawed kokopu, inanga and koaro – are collectively known as 'whitebait'. Their eggs hatch in autumn and the larvae are washed out to sea. Six months later they make the hazardous return journey as juveniles. Most of the whitebait fishery catch is inanga.

Juvenile kokopu and koaro may migrate over 100km upstream, even climbing damp rocks beside steep waterfalls, until they reach sheltered streams and wetland habitats.

Insects and other creatures

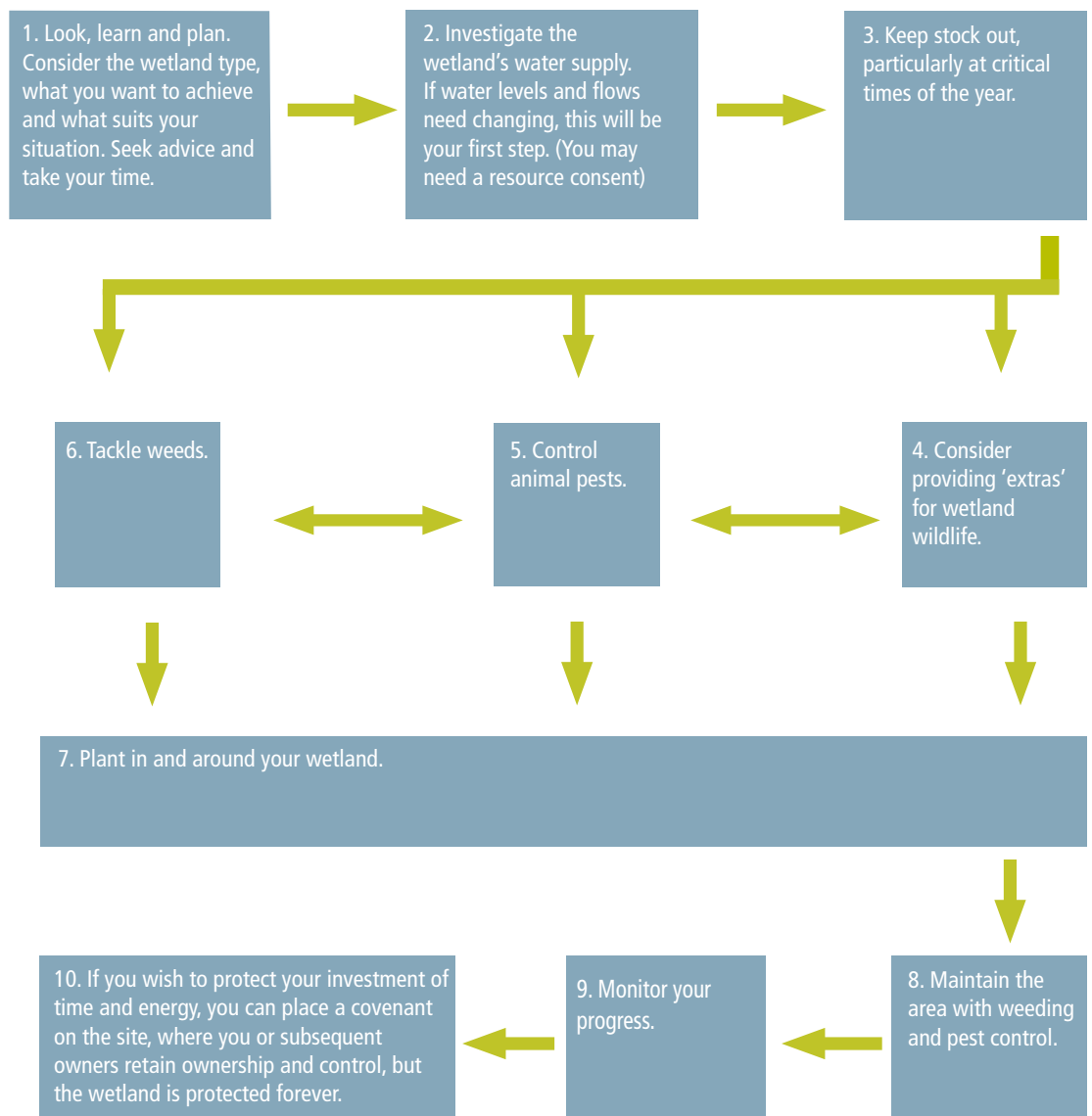
Although birds are the most visible component of wetlands, other animals like invertebrates (such as insects), amphibians and reptiles (lizards, etc) also live there. Typical wetlands can have hundreds of normally unseen insect species.

How do I restore a wetland?

Keep all wetland restoration work as simple as possible. Your goal is a wetland that takes care of itself with little effort from you.

The steps that follow are a general guide that focus on swamps (estuaries and peat bogs will have different management needs). Each wetland is unique, so some steps may not be necessary in your situation. We recommend you seek professional help for detailed information and advice. There is a list of contacts at the back of this booklet.

Larger wetlands may contain several different types of plant and animal communities, and all wetlands change with time as environmental conditions change.



Look, learn and plan



No two wetlands are alike – how they look and the plants and animals they contain will vary with local conditions (eg, soils, climate and water flow).

Before you start restoring your wetland, develop a site plan and ask yourself:

- What's there now? Plan to protect and encourage any desirable plants first.
- What was there originally?
- What would you like to see in the future?
- What are your aims? Erosion control? Wildlife? A water source?
- How much time and what resources do you have?
- What effect will your activities have on neighbouring properties, both upstream and down?
- Could you work with neighbours?

Seek advice and help

Talk to Greater Wellington and the groups listed at the back of this guide about your goals. They can advise you on what to plant and options for funding.



Investigate the water supply

Your wetland and its water

Wetlands are covered or soaked for at least part, and often all, of the year. They depend on a natural supply of water – from tidal flows, streams, flooding rivers, connections with groundwater, rainfall or a combination of these.

The water level in your wetland, and how much it fluctuates, will determine the plants and animals it can support.

Before you even lift a spade, spend some time monitoring the source and amount of water, especially over the seasons. Use a ‘depth marker’ (such as a wooden post) to mark water levels at different times of the year, and use stakes to mark the edges of the winter water levels and summer water levels. This will help you decide if the water levels need restoring, and what to plant and where.

A number of things can damage a wetland’s natural cycle of flooding and drying. They happen at two key places:

- At the ‘wetland’ level the cycle can be affected by drainage (including the construction of drainage ditches) and filling and levelling low-lying areas.
- At the ‘catchment’ level (ie. the source of the wetland’s water) the cycle can be affected by fewer floods than normal (if rivers are stopbanked), overusing water in streams and groundwater, and the drainage of nearby wetlands.

If your wetland has been partially drained, you’ll probably need to increase its water levels by filling in or blocking ditches or drains. If there have been changes within the catchment you may need to increase water levels by building a low bund, weir or dam, or other earthworks. Before you make any changes to water levels or undertake any earthworks, contact Greater Wellington and your local council for information about resource consents.

Creating areas of open water

It's generally not a good idea to create areas of open water by excavating material out of existing wetlands or creating dams. Areas of open water can be difficult to keep free of weed and algae in summer, and dams can block fish access – and most native birds prefer swampy rushes and flax rather than deep, open water.

Avoid damming or excavating wetlands that have not been previously disturbed and that support native plants and animals. If you want to create open water, choose degraded wetland areas that have been partly drained and are covered in weeds. And make sure you create gently sloping, irregular shorelines. This allows birds, particularly waders, chicks and ducklings, easy access to and from the water and will extend the belt of reeds and rushes growing around the edge.

Note: You may need a resource consent for this work, so check with your local council and Greater Wellington first.



Keep stock out

Stock that venture into wetland areas are likely to increase the soil's nutrient levels, pug the soil, cause erosion, disturb the wildlife and eat and trample wetland plants. Cattle in particular tend to gather near water and wade into it.

Fencing stock out will encourage plants to regenerate from natural seed sources, prevent stock getting trapped, and in some areas may reduce the incidence of liver fluke. If you can, aim to exclude not just the wetland itself, but a buffer strip around it.

If you don't wish to keep stock out for the whole year – for example, if you want to keep surrounding plants cropped short for feeding waterfowl and pied stilt – it's better to graze a small number of sheep as they are less likely to enter water, pug soil or ring-bark trees. The best time is mid-summer to mid-autumn, as your wetland will be drier and most bird breeding will be over.

Control the weeds

Weeds are one of the greatest threats to wetlands and, in many cases, weed control will be the most important thing you can do in restoring yours. If you're planning any planting, you must control weed species in and around the area first – and continue weed control once your planting is complete.

The first step is a weed audit, in which you use a map of the wetland to locate and identify weed infestations. The next step is to gather information on how to control the weed species. You can then decide where to start the weed control, and when – and remember, it may take several seasons to control a serious weed infestation.

You may find you need help from a specialist qualified to use herbicides in wetlands.

Contact Greater Wellington's biosecurity officers for information and advice on how to control wetland weeds.

Wandering willows

Willows were introduced to New Zealand for bank stability, shelterbelts and fodder. However, their dense growth can block stream flow and shade out native species. Crack willow and grey willow are particularly invasive – their broken branches take root easily in muddy soils, and grey willows have tiny, windblown seeds.

Willows can be controlled in a number of ways – we recommend you first seek specialist advice from Greater Wellington's plant pest officers.



Helpful hints on weed control

- When working with spades and machinery in weedy areas, wash them down before using them elsewhere to prevent weed spread.
- Fence out stock to reduce the spread of weeds.
- Barley straw reputedly inhibits algal growth and boosts aquatic insect life in slow-moving water. Two bales should keep around half a hectare of shallow, open water free of algae for six months. Either spread it out or anchor it in one position – eventually it will sink and decompose.

Control animal pests

A number of animals pose significant risks to wetland bird and plant life, for example:

- possums, hedgehogs, stoats, weasels, ferrets, cats and rats all take birds' eggs, and most will also eat chicks and adult birds,
- magpies are territorial and aggressive to other birds,
- rabbits, hares and possums eat wetland plants,
- dogs may harass wetland birds (note: high-tensile net fencing will discourage dogs from entering the wetland and provide more incentive for birds to nest).

Pukeko can also pose a problem. Although a native to New Zealand and a natural part of a wetland ecosystem, they can nibble on and uproot newly planted seedlings. To deter them, use large and heavy potted plants. Alternatively, try placing a hedge of short sticks around the plants, or use plant protectors.

Animal pest control will enhance bird life in your wetland and protect young plants. Contact Greater Wellington for practical advice and fact sheets on the best animal pest control methods for your situation.



Stoat

Provide 'extras' for wildlife

Extras for birds

As well as providing the basics for birds (water and shelter), you can provide a number of 'extras' that will make your wetland a highly desirable home:

- Provide logs and trees in the water as well as the banks for perching sites and shelter.
- During the breeding season (September to December for most species) either stop or significantly reduce grazing and other activities - birds are particularly sensitive to disturbance at this time.
- If your wetland is near a block of native bush or another wetland, consider linking them with a 'green corridor' of native plants.

Extras for fish

If your wetland is connected to a stream (or streams) at least 10 centimetres deep – it should be accessible to most native freshwater fish. Long stretches of fast-flowing or polluted water and overhanging culverts can act as impassable barriers and stop fish getting to your wetland.

Native fish also need streams with fairly clear water, shading and cover. Muddy water limits their vision and reduces their food supply of aquatic insects.

Help fish find your wetland using the tips below:

- Plant overhanging species like flax and sedges for shelter and to keep the water cool.
- A hay bale placed at the head of a ditch entering your wetland will act as a simple silt trap.
- When clearing drains, leave one side or parts of it untouched until plants have grown back.
- If using culverts in streams, set them low in the stream bed.
- Rough up the smooth bottom of culverts with cement or rocks to slow water flow.

Start planting

Prepare a planting plan

When you're ready to plant your wetland, divide it into three plant zones:

- Moist soils that flood infrequently.
- Wet soils, with temporary flooding.
- Standing water/water margin.

Identify any desirable plants you already have in each zone, and list the plants you can use in each, taking into account wind and drainage.

The table on the following page includes a small sample of potential species. Not all will be suitable for your area or situation – coastal and upland areas, in particular, have their own species associations.

Discuss your list with local experts such as native plant growers, botanical societies and the contacts at the back of this guide.



It's a good idea to buy your plants from nurseries that source plants from your district. This will ensure they're suited to your climate and soils.

You may also be able to grow some of the plants you need from seeds or cuttings taken from neighbouring wetlands, with permission. Keep use of cuttings to a minimum and take them from a large number of parent plants, to ensure a good genetic mix and that you have male and female plants.

Planting zones and plant examples for wetland planting

See
www.gw.govt.nz/wetlandplants
 for more species



Zone 1: Moist soils Flood infrequently

Karamu

Quick cover, good erosion control with fibrous roots, bird-distributed seeds. Eaten by rabbits, but not possums. Can be used as a nurse crop. Grown from seed or cuttings.

Manuka

Fast-growing, hardy pioneer, useful as a nurse crop. Good erosion control, can grow on a wide range of soils. Grow from seed.

Kahikatea

Slow-growing, large tree that produces fruit for Kereru. Grow from seed.

Zone 2: Wet soils Temporary flooding

Toetoe (not to be confused with pampas)

Pioneer. Suitable for damp and dry soils – can grow on poor soils. Rats and stoats can inhabit dense stands.

Harakeke (flax)

Fast-growing, hardy plant. Withstands five centimetres of water, flooding and dry soils. Unpalatable to possums. Easily split into small fans or grown from seed. Attracts tui.

Ti kouka (cabbage tree)

Tolerates wet and dry soils. Rabbits eat young plants. Can be grown from seed. Hardy. Good erosion control.

Zone 3: Water margin Standing water

Lake Clubrush (kapungawha)

Grows in fertile water up to 0.8 metres deep, tolerates salt water. Wildlife shelter. Best grown from division although will also grow from seed.

Purei *Carex secta*

Grows in shallow water, boggy margins and dry soil. Shelter and nesting for ground birds. Can be split or grown from seed.

Timing

In wet areas, around the water's edge and in shallow water, plant in summer when water levels are low and the water is warm.

Otherwise, plant hardy, frost-tolerant species in autumn and frost-sensitive species in spring. Plants that need shelter or shade can be planted one to two years later, once cover has developed.

Site preparation

Clear a one-metre circle around each planting spot with a spade or a herbicide to prevent competition from grass and weeds. This will make sure your plants get enough light and nutrients.

Planting

Remember, native plants don't tolerate grazing by stock – protect your investment by keeping stock out.

When planting:

- choose sites suitable to each plant's growing requirements, leaving space for them to grow. Ferns, rushes and small sedges can be planted three per square metre. Larger plants need more room,
- dig a hole twice the size of the plant container, leaving some soft soil at the bottom. Set the plant in the hole and gradually fill in the soil, compacting it to remove air gaps,
- if you're planting on dry sites around the edge of your wetland, form a hollow around the plant's base to trap rainfall,
- give the plants and surrounding soil a good watering. Water young plants over dry spells.

Staking the plants at this stage will make them easier to find later. Tall, thin bamboo stakes highlighted with spray paint are ideal.

Looking after your plants

Weeds can overwhelm your plants in the first one to three years. Smothering by tall grass is the most common cause of planting failure.

It's important to maintain your plants during this time by clearing the weeds around them. You can weed by hand or with a grubber or herbicide – and save further weeding by using mats (eg, non-rubberised carpet underlay) that eventually decompose. Pests such as rabbits and possums should also be controlled, particularly during the plants' seedling stage.

Once the plants have grown tall enough, they will begin to shade out grasses and aquatic weeds and will no longer need weed control. After three years, your plants should take care of themselves.

Herbicides

You can greatly reduce the need for manual weeding if you use glyphosate herbicide (we don't recommend long-lasting residual herbicides, as they remain toxic to plants three to four months after application).

The best time to spray is late summer when water levels are low and most nesting and flowering have taken place. Chemicals are transported rapidly through water, making wetlands more sensitive to pollution and herbicides.

You can get more information on suitable herbicides and suggested application rates from plant pest officers at Greater Wellington.

Note: If you want to apply herbicide to weeds that are in the water, you will need a resource consent.

More planting tips

- The best time to plant in zones 2 and 3 is in summer when the water levels are at their lowest.
- To ensure your plants have the highest as possible a chance of survival, use larger potted plants. They are also less likely to be uprooted by pukeko.
- When planting the dry edges of wetlands, use a mulch at least 10cm deep. This can be untreated wood chips, compost, cardboard, old carpet underlay or rotted hay. It will help to conserve water from evaporation, keep weeds down and add nutrients. Alternatively, leave a low grass cover around the plants for the first summer (until March) to help conserve water.
- Use fast-growing species such as manuka as nurse plants to provide shade for seedlings underneath.

Monitor your progress

Make sure you maintain an ongoing programme of weed and pest control. Keep a photographic record and a diary of progress. It will help you to learn what works and what doesn't and make changes as necessary. It will also be a record to show you how much you have achieved.

Protect your investment

You can protect your investment of time and energy by placing a covenant on the site. This means you or subsequent owners retain ownership and control, but the wetland is protected forever.

Case study

Birds flock back to restored Otaki wetland

Restoring a native wetland in Otaki to its former glory is the aim of Graham Booth, a semi-retired builder from Wellington.

Graham says the previous owner had farmed cattle on the land and tried to drain the area, but it was a poor site for farming and had been labelled 'marginal pasture' by the Kapiti Coast District Council. Attempts by previous owners to modify the area had caused the soil to deteriorate.

"There was a drain running through it from about 1974. Then the owner put in a stopbank but the peat continued to shrink and the area kept flooding." says Graham.

Graham was interested in restoring the area to its original state both from an environmental perspective and as an interesting project for retirement. Having spent about a year planning, he first used heavy machinery to destroy the stopbanks and drains and create islands for birds. He then turned off the pump drainage system and allowed the area to fill up with water again.

Evidence of the project's success can be seen in the large numbers of birds that have returned to the area. Word has obviously got round the bird community, and Graham says he has counted 50 swans, several paradise ducks, some pukeko and pied stilts.

He expects more birdlife to return, and says the presence of eels and koura (native crayfish) shows the water quality is good.



Graham Booth enjoys bird watching on his newly restored wetland

Contacts for more information

Greater Wellington Regional Council

Wetland Advisory Service. For general advice on wetland restoration — and to enquire about funding available for wetland restoration. Phone 0800 496 734, or email wetlands@gw.govt.nz.

Resource consents. You may need a resource consent from Greater Wellington for wetland restoration activities, such as creating dams. To check, phone 04 384 5708 or 06 378 2484. You may also need to contact your local district or city council.

Plant and animal pest control. For advice on plant and animal pest control, phone 04 526 4133 or 06 378 2484, or email, pest.animals@gw.govt.nz or pest.plants@gw.govt.nz.

For more information on wetland plants and funding, visit www.gw.govt.nz.

QEII National Trust

The QEII National Trust helps private landowners protect areas of bush and wetland on their property by using covenants. For more information, visit www.openspace.org.nz or phone 0800 467 367.

Fish and Game New Zealand, Wellington Region

Fish and Game New Zealand provides specialist advice and support for landowners seeking to enhance wetlands or develop farm ponds for game bird habitat. Funding may be available and approved projects can receive up to 50% financial support. For more information, visit www.fishandgame.org.nz or phone 04 477 6118.

Department of Conservation

Department of Conservation (DoC) staff can provide advice on how to identify, maintain, protect, and where necessary, enhance conservation values. Contact your local area office. Wairarapa 06 377 0700, Kapiti 04 296 1112, or Poneke 04 472 5821.

Check out DoC's website www.doc.govt.nz.

New Zealand Landcare Trust

The New Zealand Landcare Trust helps with community group projects and may be able to provide funding. For more information, visit www.landcare.org.nz or phone 0800 526 322.

Your local council

Some councils offer help for landowners restoring and protecting wetlands. Check with your local council for more information.

You may also need to contact your local district or city council about resource consents.

Water, air, earth and energy – elements in Greater Wellington’s logo combine to create and sustain life. Greater Wellington promotes **Quality for Life** by ensuring our environment is protected while meeting the economic, cultural and social needs of the community

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