



FROM HEADWATERS TO HARBOUR

hooked on native fish



Our freshwater fish

LEARN ABOUT OUR UNIQUE NATIVE FISH, WHERE THEY LIVE AND WHAT YOU CAN DO TO HELP PROTECT THEM AND THEIR HABITAT.

Giant kokopu. Photo: Stephen Moore, Landcare Research

Something in the water...

Picture a freshwater fish - is the first one that comes to mind an eel or trout? New Zealand's streams, lakes, rivers and wetlands support around 50 species of native fish – galaxiids, bullies, eels, lamprey, black flounder, torrentfish, smelt and mullet to name a few. Add to this around 22 species of exotic fish. With this many species, our freshwaters should be packed with all sorts of fish, right? Read on to find out what the story is.

Meet the locals!

Many of our native fish are seldom seen because they are secretive, small, camouflaged, live in remote areas, or are nocturnal, hiding under rocks and overhanging vegetation during the day. Our native fish are also rare – half are threatened with extinction, with one already extinct – the grayling, last seen in the 1920's.

If they don't end up in a frying pan, some of these tiny fish can migrate over 100 km from the sea upstream. Photo: Peter Hamill, Marlborough District Council

The Galaxiids: Aquatic all-stars

Galaxiids are New Zealand's largest group of freshwater fish with 29 species including inanga, kokopu, koaro and mudfish. The name galaxiid refers to the clusters of golden or silvery star-like patterns on their scale-less bodies - perfect camouflage in the dappled light of the small forest streams they tend to favour. They are also found in swamps, drains and larger waterways. Many galaxiids, particularly koaro, are great climbers, able to scale waterfalls helped by ridges on their fins. Invertebrates, both aquatic species like midge, mayfly and mosquito larvae, and those that fall into the water, are an important part of their diet.

Mudfish: summer sleepers

Mudfish have a bizarre ability to live out of water in tree root hollows and damp leaf litter for weeks at a time during dry periods. They are able to do this by wriggling their cigar-shaped bodies into tiny crevices, where they semi-hibernate (aestivate) by 'breathing' through their moist skin. This means that they can survive in seasonally dry waterways, drains, pools and swamps. All 5 species of mudfish are considered highly threatened due to habitat loss.

Despite their name, mudfish actually require clean water, and are a good indicator of a healthy environment. Photo: Stephen Moore, Landcare Research

There's more to whitebait than fritters!

Whitebait are actually 5 species of galaxiid. As "diadromous" fish, they spend part of their life in the ocean and part in freshwater. Adults gather from autumn to winter to breed. Some species like banded kokopu lay their eggs in amongst leaf litter in forested streams during high flows. Other species migrate downstream to lay their eggs and one species, the inanga gathers in estuaries to spawn on king tides. Their eggs stick to damp grasses, rushes, sedges and flax on the river banks, and hatch around two weeks later on the next set of high tides. Floods and ebbing tides induce the larvae to hatch before being carried by the current out to sea where they spend four to six months feeding on microscopic plankton. They return to freshwater between early spring and early summer, swimming upstream together as whitebait.

The traditional kiwi pastime of whitebaiting is under threat!

The long-term survival of our native fish is uncertain because their habitat is still being destroyed by wetland drainage, pollution, vegetation clearance, stock damage, over-fishing and continued commercialisation. Barriers in waterways such as culverts hinder their migration, and introduced fish such as trout prey on them.



Eels: Slippery characters

Three eel species are present in New Zealand; **shortfin**, **longfin** and the **Australian longfin**, or spotted eel, thought to have arrived of its own accord as recently as 25 years ago.

The longfin inhabits all types of water from tiny streams to the largest rivers, coastal and inland lakes, brackish (semi-salty) estuaries and lagoons. Shortfins however prefer warmer brackish waters, coastal lakes and lowland lakes.

Considered a threatened species, longfin catch limits have recently been reduced and a maximum size limit applied to protect the large mature females.

Like some galaxiids, eels also make the arduous journey downstream and out to sea to complete their life-cycle.

NATIONAL TREASURES

EELS (TUNA) ARE SUCH AN IMPORTANT RESOURCE FOR MAORI THAT IN THE PAST BATTLES WERE FOUGHT OVER THEM. TUNA WERE CAUGHT USING WOVEN POTS (HINAKI), STREAM FENCES (PA TUNA), SPEARS (MATARAU), NETS (KORAPA), BAITED LINES (TOI), DITCHES (KOUUMU) OR BARE HANDS.

MAORI IDENTIFY MANY MORE VARIETIES THAN THE THREE SPECIES RECOGNISED BY SCIENTISTS, WITH OVER 100 LOCAL NAMES FOR EELS.

The longfin can grow to 2 m long and live for over 100 years! The record is a 24 kg whopper caught at Lake Waihola near Dunedin. Photo: Stephen Moore, Landcare Research



Bullies: tough stuff!

There are 7 species of native **bully**. Unlike the galaxiids they have coped well with humans, remaining fairly widespread and abundant, with only one species regarded as threatened. They are "generalists", occupying all types of aquatic habitat and feeding on a wide range of food.

Redfin bully. Photo: Peter Hamill, Marlborough District Council

You can help our native fish survive and thrive!

- Plant riverbanks with natives
- Install "fish-friendly" culverts
- Fence stock out of waterways
- Never tip pollutants down drains
- Leave stable wood debris in streams for habitat
- Take only enough eels and whitebait you need for a feed
- Never release or transfer live exotic fish into native fish habitat



Introducing the exotics

In the late 19th century early settlers introduced **trout** and **salmon** for sport and food. So treasured are these two game fish that their habitats get special protection under the Resource Management Act. **Char**, **tench**, **rudd** and **perch** are also fished for. Rudd, though a sportsfish in the Auckland/Waikato region, is regarded as a pest elsewhere. **A Fish and Game licence is required to fish for these species.**

Pets or pests?

Many aquaria and pond fish have been released into waterways, becoming major pests. They've rapidly colonised areas, in some places building up huge populations. Exotic fish threaten the survival of native fish:

- **koi carp** uproot native aquatic plants, stir up sediment
- **catfish** stir up sediment, eat native plants, snails and fish
- **gambusia**, ("mosquitofish"), **tench**, **rudd**, **perch** and **goldfish** eat native insects, plants and fish, denying our native fish their food supply

Stop the spread

- **Never, ever** release unwanted aquarium plants or fish to waterways, or tip down the drain
- Wash your boat, trailer and fishing gear carefully after each trip to make sure they are free of weeds, fish and fish eggs before launching
- It is illegal to release any fish into a natural watercourse without a permit, or to breed or sell pest fish

If you weighed all of the fish in the Waikato Basin, a staggering 80% would be koi carp. Photo: Nelson Mail

Want to know more?

www.TeAra.govt.nz/en/life-in-fresh-water/4

www.nzfreshwater.org/

www.mudfish.org.nz/

www.niwa.co.nz/our-science/freshwater/tools-old/fishatlas/fishfinder

www.doc.govt.nz/conservation/native-animals/fish/facts/

Fishy factsheets in this series:

#1 Our freshwater fish

#2 Stream works for fish

#3 Fixing your stream edges

#4 Native fish in the city

#5 Native fish on the farm

#6 Caring for our catchments

All factsheets can be downloaded from: www.landcare.org.nz

Published by NZ Landcare Trust 2010.



NATIVE FISH IN THE LANDSCAPE

In a healthy landscape, our native freshwater fish can be found in all sorts of places...



Longfin eel



Dwarf galaxias



Shortjawed kokopu

Longfin eel

Dwarf galaxias

Upland stream

Hydro lake

Common bully

Forested wetland, areas of native forest and small pools

Redfin bully

Banded kokopu

Torrentfish

Mid-reach stream – fast flowing but below waterfall/dam

Lake with a river inflow and drain outlet

Mudfish

Drain

Shortfin eel

Common bully

Banded kokopu

Giant kokopu

Common bully

Lowland stream – wide, sluggish

Giant bully

Giant kokopu



Brown mudfish



Shortfin eel



Grey mullet





Koaro



Common bully



Redfin bully



Banded kokopu



Torrent fish



Shortjawed kokopu

Streams in forest, solid canopy, small rubbly streams

Longfin eel

Koaro

Longfin eel

Streams in forest, solid canopy, small rubbly streams

Giant kokopu

Lowland swamp

Mudfish

Grey mullet

Common bully

Giant bully

Estuary
Smelt

Inanga

Lamprey

Black flounder

Giant bully

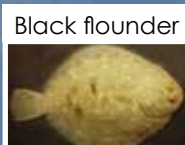
Sea



Smelt



Inanga



Black flounder



Lamprey



Giant bully

Stream works for fish

FISH-FRIENDLY STREAMS PROVIDE DIVERSE HABITATS FOR OUR NATIVE FISH AS WELL AS THE INSECTS AND PLANTS THEY NEED FOR FOOD AND SHELTER. READ THE FACTS THEN JUMP IN AND GIVE NATIVE FISH A HAND!

Mangakotukutuku stream, Hamilton.
Photo: Monica Peters, NZ Landcare Trust.

Focus on the water...

Many stream protection works focus on the land such as planting slopes and banks to reduce erosion, creating grass filter strips to trap silt, and putting up fences to keep stock out. However, for our native fish surviving in the streams themselves can be a real challenge. Straightening, diverting, or dredging streams and installing weirs can dramatically alter stream flow and destroy fish habitat.

Fish-friendly streams

Riffles, pools, reaches, rapids, falls, glides, eddies, meanders, overhangs, and undercuts – there's more to a stream than just water. To survive and complete their lifecycle native fish need suitable:

- habitat type and variety
- water quality (temperature, oxygen levels, clarity, pH, nutrients)
- stream flow (quantity and speed)
- food supply (plants and insects in stream and on stream margins)
- protection from predators
- migration pathways to the sea for some species

Give our fish a hand!

Clear the water

Sediment in streams clogs fish gills, makes it harder for them to find food and can affect migration. Dense riparian vegetation can trap silt, but for a short-term fix secure hay bales across muddy ditches that enter your stream. Livestock pollute water - keep them out and provide them with tanks or nose-pumps for drinking water.

Keep predatory pests away!

Pest fish such as koi carp and gambusia prey on native fish and insects. Though it's best to leave pest fish eradication to the experts, you can help minimise their spread by carefully cleaning boating and fishing gear between waterways to destroy eggs. Never release pest fish into the wild – it's illegal.

Minimise drain maintenance

Excessive sediment, weed and algae growth can clog drains. Minimise drain disturbance by using registered sprays or weed rakes instead of digger buckets to remove excess weed growth. Leave some drains intact each year to ensure fish survive. Carry out any works in late summer/early autumn to avoid spawning and migration.



Well anchored woody debris provides important habitat for fish such as kokopu. Photo: Brenda Aldridge, NIWA. Giant kokopu. Photo: Stephen Moore, Landcare Research.

Coromandel potter Barry Brickell uses plates and bowls to create novel fish ladders. Photo: Monica Peters, NZ Landcare Trust.

Designer debris

Objects in waterways like logs and boulders can cause headaches for flood managers and create hazards for swimmers and boaties, but fish need in-stream debris:

- for shelter from strong currents
- to escape predators
- to provide shade and cover during the day
- to lay their eggs on or under
- to trap or support food, like leaves, detritus and insects
- to increase habitat diversity

Leave stable debris in streams, and think twice before removing large trees that fall into waterways if they pose no hazard.

Going with the flow

Many native fish migrate between the sea and upstream habitats often as tiny fry, but dams, weirs, tide gates and poorly designed or perched culverts (the most common barrier) can block their path.

New Zealand culvert designs use the ability of elvers, young kokopu, koaro and bullies to wriggle between stones, spend brief periods out of water, and climb wet margins of waterfalls and culvert sides. Note that culvert designs for trout may not suit our smaller native fish.

In some situations there is no need to install fish-friendly culverts, for instance if there is a natural barrier such as a large waterfall downstream, or no suitable habitat upstream. Barriers can also be useful tools to prevent the spread of pest fish, or to protect naturally isolated native fish, e.g., mudfish, from competitors, like trout.

Seek advice from your regional council and Department of Conservation to find out if fish-friendly culverts are appropriate for your stream.

Fish-friendly culverts ensure that:

- water flows slowly (< 30 cm per second)
- there are fish rest areas (e.g. rocks or smooth damp walls)
- at least 10 cm of water always flows through
- fish aren't required to jump

Culverts fitting in with nature:

- mimic the natural streambed by following the natural slope and original streambed direction

- are wider than the stream at average flow
- are large, and never more than half full of water during spring
- are installed in late summer/early autumn after spawning and migration

Encourage fish passage by having:

- a rough bed to slow water flow
- smooth not corrugated surfaces above water for fish to climb on
- resting areas if they are longer than a few metres

Enhance water quality by:

- diverting raceway/road run off
- fencing the stream
- having a spillway for flood flows

Protect fish habitat by:

- rock riprap at the culvert outlet to prevent scouring
- a notched rock weir or rock ramp downstream to create a resting pool
- good riparian vegetation to shade resting pools and protect stream margins

Get consent

Waterways are shared resources and things you do in them can affect people and ecosystems up and down stream.

Before you undertake any in-stream works contact your regional and local council to find out if you need a resource consent or to meet a set of conditions.

Perched culverts prevent fish passage upstream. However they can be retrofitted, such as this one (below) which has used mussel spat ropes to enable eels to access Lake Harihari.

Right: A close up of whitebait climbing rope. Photos: Bruno David, Environment Waikato



Want to know more?

Use the internet to search for key phrases on the following sites.

In-stream restoration

National Institute of Water and Atmospheric Research
www.niwa.co.nz

University of Auckland
www.cebl.auckland.ac.nz

University of Canterbury
www.sustain.canterbury.ac.nz

Waitakere City Council

www.waitakere.govt.nz

Auckland Regional Council
www.arc.govt.nz

Fish-friendly culverts and fish access

Environment Waikato
www.ew.govt.nz

Greater Wellington
www.gw.govt.nz

Auckland Regional Council
www.arc.govt.nz

Department of Conservation
www.doc.govt.nz

Other fishy factsheets in this series:

#1 Our freshwater fish

#2 Stream works for fish

#3 Fixing your stream edges

#4 Native fish in the city

#5 Native fish on the farm

#6 Caring for our catchments

All factsheets can be downloaded from: www.landcare.org.nz

Published by NZ Landcare Trust 2010.

Fixing your stream edges

OUR NATIVE FISH LIKE TO KEEP THEIR COOL. THEY'RE USED TO SHADED WATERWAYS LINED WITH DENSE VEGETATION BECAUSE OVER 80% OF NEW ZEALAND WAS ONCE FORESTED. READ ON TO FIND OUT THE THREE STEPS FOR RESTORING STREAM HEALTH AND FISH HABITAT.

Photo: Waitete Stream,
Rob Davies-Colley, NIWA.

Stream wise

Our native fish love living in streams and rivers lined by native grasses, trees and shrubs. Fish need bushy overhangs to shade the water, provide cover, stabilise the banks, and drop leaves and insects for the fish to eat. Did you know that...

- fencing rural streams from stock dramatically improves water quality and can prevent possible stock losses in boggy ground
- planting stream banks can dramatically improve native fish habitat and water quality
- whitebait lay their eggs on long grass, sedges and rushes by coastal streams and estuaries
- seeps and springs densely planted with sedges, native toetoe and flax help trap sediment, nutrients, bacteria and other pollutants before entering streams and waterways
- if you're on a farm, planting and fencing your drains will reduce weed growth and drain maintenance costs in the long term as well as provide habitat for other species such as insects and birds

Priority fish habitat restoration areas:

- open streams such as farmland with no riparian vegetation
- small streams in the head-waters of catchments
- sunny (north and west-facing) sides of streams
- continuous strips of at least 200 m to cool the water
- estuaries where sedges and grasses can be planted for whitebait spawning habitat

Check with your regional council before planting drains – there may be controls on access for maintenance.

Inanga/whitebait eggs amongst the sedges. Photo: Sjaan Charteris, Crown Copyright, Department of Conservation.



Inanga/whitebait.
Photo: Stephen Moore, Landcare Research

Three steps for restoring streams

1. Prepare

Good site preparation will improve the success of your planting. Preparation should commence over summer, in readiness for planting over autumn and winter.

If your site is in rank grass, you can mow, lightly graze, or spot spray with the appropriate herbicide or plant straight into it depending on the species. Sites with short grass can usually be planted directly into, but take care if there is kikuyu or pasture weeds that could overgrow your plants.

Some sites can be full of exotic weeds, particularly near urban areas. Many weeds will overgrow native plants if they are left unchecked. Make sure you do a thorough job of removing weeds before planting out any natives. For very weedy sites, stage weed control and planting over several years. This allows you to tackle a small area at a time, and also improves the transition between a weed dominated system to a native one. Remember that in the absence of native trees and shrubs birds, lizards and fish may be utilising the exotic weeds as habitat.

Check out the Weedbusters website for advice on dealing with problem weeds or contact your local council for more information.



manuka

mahoe

toetoe

flax

cabbage tree

Waitete Stream, Waihi. Photo: Rob Davies-Colley, NIWA.

Cabbage trees are both fast growing and great bank stabilisers.



Planting kowhai, karamu and flax provides food for native birds such as the Tui. Photo: Dianne John.

2. Plant

Autumn is the optimum time to plant. This allows plants time to establish over the colder, wetter months in readiness for the summer. For areas which suffer from heavy frosts, it can be best to wait until later in the season so that your young plants are not killed. Very wet sites are best planted in spring to early summer, once water levels have receded. This ensures that plants do not become waterlogged or washed away during the winter rains.

A helpful tip: Make sure to place a stake next to each plant. This will help you find them when you are weeding and is a useful way to tell if any plants have died and need replacing. It is amazing how difficult it can be to relocate plants once the surrounding weeds have started to grow in spring and summer.

Which plants should I use?

The best way is to find a natural stream or wetland near your site. Observe what is growing naturally and try to recreate this pattern. Often it is best to start with a few hardy species and to allow others to colonise the site

Blackberry establishes rapidly and is likely to require on going maintenance.



naturally over time. Alternatively, 'diversity' species can be added at a later date once the original hardy 'pioneer plants' are established. The best species to plant depends on your location, so always source local information. You can get advice on what to plant and when to plant from your regional council, NZ Landcare Trust or the Department of Conservation.

Here are some suggestions:

Fast growing trees and shrubs:

Manuka, kanuka, karamu and cabbage trees.

Great bank stabilisers: Sedges, cabbage trees, lowland ribbonwood, karamu, tutu*, lemonwood and kohuhu. (*tutu is poisonous to stock and humans.)

Homes for fish: Carex sedges, giant umbrella sedge and native toetoe near the stream edge.

The edges of wetlands: Sedges, flax, cabbage trees and native toetoe.

Flood prone areas: Sedges and native toetoe.

Attracting birds: Kowhai, karamu and flax

As a general rule, plant sedges 1 m apart, shrubs 1.5 m apart and trees 2-5 m apart. Where weeds are a problem, plants should be closer together to help shade them out.

3. Maintain

Maintenance is the key to a successful planting. Many planted areas have inadequate weed control, causing high losses as weeds overgrow and kill native plants. Committing to regular maintenance will ensure that the efforts of preparing and planting the site have not been wasted. New riparian plantings will need regular weed control for 3-4 years or until they are tall enough and dense enough to out compete weeds. New plantings should be checked once per month during spring and summer. Hand weeding around the base of each plant is all that is required. You will need to be particularly vigilant on sites that had lots of weeds originally, or where there are weeds nearby that will colonise the site. You will need to replace any plantings that die as leaving gaps may mean weeds move in. Don't forget about pest control – rabbits, hares and possums like to nibble new plantings. Pest control can be conducted using traps or baits, with detailed information available from your regional council.



Want to know more?

Many native plant nurseries specialise in wetland and riparian plants, or you can propagate or transplant your own (see Environment Waikato's guide Planting Natives in the Waikato Region for tips). To learn about native plants check out the New Zealand Plant Conservation Network www.nzpcn.org.nz

A simple web search for 'riparian management' and 'riparian planting

guidelines' for NZ sites will bring up a host of links.

Check out 'A Guide to Managing Waterways on Canterbury Farms' Environment Canterbury www.ecan.govt.nz

'Clean Streams' Environment Waikato's www.ew.govt.nz 'Riparian Planting and Management Guidelines for Tangata Whenua' Ngai Tahu www.ngaitahu.iwi.nz and Landcare Research riparian planting studies in the Sherry River Catchment (Tasman) www.icm.landcareresearch.co.nz

Fishy factsheets in this series:

- #1 Our freshwater fish
- #2 Stream works for fish
- #3 Fixing your stream edges**
- #4 Native fish in the city
- #5 Native fish on the farm
- #6 Caring for our catchments

All factsheets can be downloaded from: www.landcare.org.nz

Published by NZ Landcare Trust 2010.

Native fish in the city

OUR CITIES HAVE A MAZE OF WATERWAYS, OFTEN FORGOTTEN, TUCKED AWAY BENEATH WEEDY BANKS, OR BURIED IN CONCRETE PIPES UNDER BUSY STREETS. NATIVE FISH, OUR HIDDEN TREASURES MAY STILL BE SURVIVING – BUT ONLY JUST. READ ON TO FIND OUT WHAT YOU CAN DO TO HELP.

Monitoring water quality in an Auckland stream.
Photo: Janet McDonald, Atlas Communications & Media Ltd for Project Twin Streams.



Common bully. Photo: Stephen Moore, Landcare Research.

Stressed out city streams

Urban streams are usually in worse condition than rural streams for every water quality measure: clarity, nutrients, temperature, bacteria and heavy metals. This leads to low aquatic species abundance and diversity.

In cities, our fish encounter a bewildering tangle of pipes, culverts, channels and drains with overheated, murky and polluted water. Streams are being lost every day to urban development, particularly small streams high in the catchment. In Auckland 11 km of streams are piped every year.

- Fish living in urban streams are doused with harmful substances washed off our roofs, streets and building sites every time it rains.
- Concrete slurry, paint, food scraps, oil, fuel, mould killer, heavy metals, car cleaners, weed sprays and soil carried in stormwater can poison, burn, blind or suffocate fish.
- Heavy downpours on hard surfaces like roads, roofs, driveways and car parks send large pulses of water down streams, eroding banks, transporting mud, rubbish and sometimes causing sewer overflows.

They're streams – not drains!

In the past we've treated urban streams as drains, straightening them, channelling them and piping them to make them quickly carry away rain and wastewater.

But urban waterways may:

- have significant areas of native riparian or wetland vegetation
- provide habitat for native plants and animals
- provide corridors for birds and insects
- be valuable recreational assets
- soften the urban landscape
- contain heritage sites of historical and cultural importance

Fish images near drains in Hamilton help remind residents about the connection between storm water drains and the city streams – and fish habitats - they are piped into. Photo: Monica Peters, NZLT.



Okeover make-over

The Okeover Stream flowing through Canterbury University has had a major make-over. A 60 m stretch was re-vegetated using locally sourced native plant species. Rocks and salvaged old logs were strategically anchored in the stream to increase habitat diversity and slow water flows.

Photo: Duncan Shaw-Brown, University of Canterbury (2004).

Breathing life back into urban streams

There is an increasing interest in urban stream restoration. Even if you don't live by a stream, there will be a network of underground pipes connecting your home to the closest stream. Some of you may be lucky enough to live beside a stream or river. Either way there is lots that you can do to keep streams healthy.

1. Let nothing but rain down the drain

- Take care with chemicals, including water-based paint and detergent, and never tip pollutants down drains, or near streams.
- Disconnect your down pipe if cleaning your roof to prevent chemicals entering stormwater.
- Never tip aquarium plants or fish down the drain, or anywhere near a stream – these can compete with our native fish and aquatic plants.
- Keep the clutter out of the gutter by sweeping up grass clippings and picking up rubbish.

Avoid these ordinary household products ending up in a stream. Photo: Monica Peters, NZLT.



Ambitious council-led projects have turned lifeless stormwater channels...



...into habitats for native fish (and an asset to local residents!) Photos: Boffa Miskell.

2. Get Involved!

- Plant native sedges and shrubs on the banks and in wet seepage areas to provide shade and food for the fish from fallen leaves and insects.
- Let grass grow tall on the bank edges until your streamside plants are established.
- Remove invasive weeds growing near the stream so they don't spread.
- Pull out any litter from the stream that you can safely reach, but leave stable fallen logs and boulders for fish habitat.
- Join a local stream care group to protect your local waterways.

- Keep streams natural. Dams, weirs, ditches, and diversions can harm fish life and would likely need a council consent.

Other things you can do:

- Immediately report any dead fish, unusually smelly or discoloured water to your regional council.
- Don't let rubbish get into your stream, even cigarettes and dog droppings are dangerous.

3. Design for Fish in Mind

- Use grass pavers or cobbles instead of concrete for driveways to allow rain to soak naturally into the ground.
- Install rainwater tanks to harvest water from the roof and reduce the volume of water rushing into our streams. This water can then be used to water the garden.

Pat Williams from the Waterways Ecology Team. Photo: Abby Davidson, NZLT.



Want to know more?

Contact your local council for advice on improving water quality and conducting stream restoration. Alternatively, search for the key words in the following websites:

Urban stream pollutants

www.northshorecity.govt.nz

www.waternz.org.nz

www.bethedifference.gw.govt.nz/story2383.cfm

Urban stream restoration

www.niwa.co.nz/ and www.wrc.govt.nz/

Urban stream restoration groups

Oakley Creek, Auckland
www.oakleycreek.org.nz/

Meola Creek, Auckland
www.meolacreek.org.nz/

Waitakere Streams, Auckland
www.waitakere.govt.nz/Abtcit/ne/twinstreams.asp
WaiCare, Auckland

www.waicare.org.nz
Mangakotukutuku Stream, Hamilton
www.streamcare.org.nz/

Okeover Stream, Christchurch
<http://nwp.rsnz.org/content/cant.htm>

Fishy factsheets in this series (2010):

#1 Our freshwater fish

#2 Stream works for fish

#3 Fixing your stream edges

#4 Native fish in the city

#5 Native fish on the farm

#6 Caring for our catchments

All factsheets can be downloaded from:
www.landcare.org.nz

Published by NZ Landcare Trust 2010.

Native fish on the farm

GOOD FARM STEWARDSHIP IS ABOUT MAKING SURE YOUR FARM IS HANDED ON IN AS GOOD OR BETTER SHAPE THAN YOU RECEIVED IT. THE SAME GOES FOR THE WATER THAT FLOWS THROUGH YOUR LAND. LEARN HOW TO KEEP YOUR WATERWAYS HEALTHY FOR THOSE DOWNSTREAM, WHILE BENEFITTING YOUR OWN FARM.

*A well planted farm stream, Raglan.
Photo: Monica Pefer, NZ Landcare Trust.*



*Banded kokopu
Photo: Stephen Moore,
Landcare Research.*

What's good for the farm is good for fish

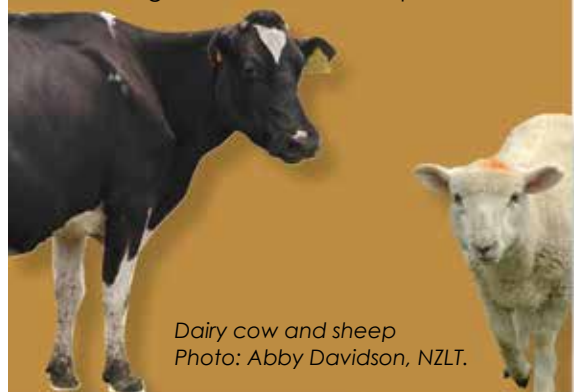
A farm without a stream is like a fish with a bicycle - pretty rare! The network of streams and even drains that cross farmland may be less than pristine, but chances are they still harbour a community of native fish, invertebrates and aquatic plants. Coastal farm streams may be a nursery for the local whitebait run, while high country sheep farms could harbour a rare mudfish or two.

Keeping your streams well-shaded, free from stock trampling, effluent, and silt, while ensuring culverts are fish-friendly will give native fish the best chance of surviving on your farm. Like the miners canary, the types of fish and invertebrates that live on your farm are a great indicator of healthy water and good farm stewardship.

- Don't watch your farm go down the drain. Planting up steep slopes, gullies and stream banks will reduce soil erosion off the farm and keep silt out of the water.
- Healthy water, healthy stock. Excess nutrients from fertilisers and effluent, coupled with hot weather and un-shaded streams, fuels algal blooms that can be fatal to humans, dogs and livestock. Prevent algae growth by fencing and planting waterways to cool the water. Where fencing is impractical, install drinking troughs and shade at the top of the paddock to encourage stock away from swamps and streams.
- Mind the spring. Boggy seepages and springs on the farm are an important source of water for streams especially during dry summer months. Instead of draining, fence and plant with native sedges and flax so they form a buffer zone to absorb and slow down runoff after heavy rain.
- Don't drain away your profits. Diggers are expensive. Fencing and planting your drains shades the weeds and keeps silt out, reducing the number of times you need to dig them out.
- Go easy on the N. Retiring eroding hill slopes and boggy areas lets you focus on getting the best production from your best sites. This will cut down on fertiliser use, saving time, money and stream health.

BEFORE: Cows had access to the stream, damaging banks and polluting the water. Photo: Fred Lichtwark, Whaingaroa Harbour Care.

AFTER: Stream fenced and planted, troughs provided for stock water. Photo: Fred Lichtwark, Whaingaroa Harbour Care.



*Dairy cow and sheep
Photo: Abby Davidson, NZLT.*





Fence them out!

Hauling cows out of swamps and waterways on a miserable winter night is no fun in anyone's book, and at up to \$1500 for a good milker losing them is not good for the pocket either. Farmers all around the country are realising good environmental practices, such as fencing off waterways, makes good business sense too.

Regional councils, NZ Landcare Trust or Department of Conservation staff can help you put together a planting plan.

Fencing makes good financial sense. Photo: Monica Peters, NZ Landcare Trust.



Where no natural riparian vegetation remains, with careful harvesting, stream edge plants can recover quickly. Photo: Robin Black, Hancock Natural Resource Group.

Waterway type	Fencing set back from channel
Small farm drains < 2 m wide	1 m, plant east and south sides in lower sedges or leave in rank grass to allow digger or sprayer arms to reach the channel
High flood risk areas or unstable land	Use temporary electric fences just beyond the flood zone, 'go wide' on outside river bends
Small streams (4- 5 m wide) – rolling land	2-3 m for every 100 m of sloping pasture up to the ridge.
Small streams (4- 5 m wide) – steeper land	10-15 m per 100 m of slope
Larger streams/ rivers > 5 m wide	> 5 m, 10-20 m for self-sustaining riparian vegetation

Fish and forestry

- Native fish are found in pine forests because there are long stable periods and good insect food.
- Stable woody debris is essential as is cover for temperature control and shelter after harvesting.
- Fish passage is critical – identify culvert crossings that work well, fix the others.
- Sediment control structures need ongoing maintenance to maintain water quality

Model farm

Scott Farm, just out of Hamilton, showcases a range of waterway management options and solutions that farmers can learn from and ultimately apply to their own farms.

The Scott Farm Riparian Demonstration Site is jointly funded by DairyNZ, the MAF Sustainable Farming Fund, and Environment Waikato. See www.dairynz.co.nz

Retired gully fenced and planted with natives. Photo: Monica Peters, NZLT.



Want to know more?

Check out "A Guide to Managing Waterways on Canterbury Farms" Environment Canterbury www.ecan.govt.nz and "Clean Streams" Environment Waikato www.ew.govt.nz

The Farm Environment Award Trust has some great examples of farmers and their "Winning Waterways" www.nzfeatrust.org.nz

If you want to know how you rate on waterway management, check out Dairy NZ's "Farm for Tomorrow: How Do I Rate?" www.dairynz.co.nz

You can find out about "Sustainable Drainage Management" from the NZ Water and Waste Association www.waternz.org.nz

Fishy factsheets in this series:

- #1 Our freshwater fish
- #2 Stream works for fish
- #3 Fixing your stream edges
- #4 Native fish in the city
- #5 Native fish on the farm**
- #6 Caring for our catchments

All factsheets can be downloaded from: www.landcare.org.nz

Published by NZ Landcare Trust 2010.

Caring for our catchments

NEW ZEALAND HAS 425,000 KILOMETRES OF RIVERS AND STREAMS TO LOOK AFTER. CLEARLY IT'S A JOB FOR US TO WORK ON AS A COMMUNITY. CATCHMENT GROUPS ARE BEING FORMED AROUND THE COUNTRY TO LOOK AFTER OUR WATERWAYS FROM THE MOUNTAINS TO THE SEA. READ ON TO FIND OUT WHAT THEY DO.

Raglan – restoring waterways in such a large catchment requires people with vision, adequate funding and lots of stamina. Photo: Monica Peters, NZLT.

Planning for change

If you want to help protect or improve the health of streams in your catchment the following steps will help.

1. Build the background picture

Talk to people who can give advice (listed on back page) about:

- what fish and other species (native and exotic) are currently and/or historically in streams
- catchment soils, flooding potential, vegetation cover
- current and historic stream and catchment photos, reports and maps
- existing programmes to restore/protect streams
- developments planned in the catchment
- contaminated sites e.g. old mines, tanneries, landfills or sheep dips
- current sources of potential contamination (water treatment plants, industries)
- rules or requirements about stream works e.g. planting banks, upgrading culverts

The freshwater dwelling black flounder. Photo: Peter Hamill, Marlborough District Council.



2. Take a hike

Take a good map and/or aerial photo, and walk or boat the length of your stream. Check for, take photos and note the location and state of:

- springs, seepages and wetlands
- culverts/ dams/ weirs (are they fish friendly?)
- waterfalls, rapids or other natural fish passage barriers
- bank erosion, stock access, areas with no riparian shade
- ephemeral (seasonal) streams
- potential spawning areas
- pipes and potential sources of discharges e.g. water treatment plants, industrial sites, or landfills
- polluted areas with e.g. cloudy/ smelly water, litter or dead fish
- invasive weeds

Discuss your findings with the Regional Council, and immediately report any signs of pollution, hazards or invasive species that need urgent attention.

What's in your stream? The unusual lamprey, a much prized food of Maori. Photo: Stephen Moore, Landcare Research.



3. Get together

Form a catchment care group with neighbours and other interested parties to develop a vision for the catchment. Some goals may be to:

- improve water quality for safer recreational use
- provide habitat for aquatic wildlife and native birds
- beautify the catchment with native plants
- restore whitebait spawning sites
- remove barriers to fish passage
- reduce flooding and prevent/ minimise erosion
- regularly monitor stream health
- fence and restore wetlands to filter out silt

List what prevents your vision or goals from being realised, and talk to people who may be able to assist you with them.

4. Develop an Action Plan

There are plenty of people out there to help you find practical solutions (listed on back page). The next step is developing an Action Plan to achieve your goals. Other factsheets in this series have basic information on improving fish habitat and riparian planting.



The big picture

Many of New Zealand's streams and rivers originally flowed through dense bush where the forest held soil together, shaded the water and dropped leaf litter and insects to feed native fish. Today the landscape has been transformed and most waterways pass through towns and farmland. Many streams are now silt-laden, less shaded, enriched with nutrients and polluted with contaminants.

Catchment groups are landowners, their supporters and advisors who work at a 'whole of catchment' scale to ensure the water that leaves their land is as good as the water that reaches it. Photo: Abby Davidson, NZLT.

Getting good advice

The following are likely to have information about your catchment and how to restore it, or may wish to get involved.

- Local landowners and residents
- NZ Landcare Trust
- Regional and District councils
- Scientists from NIWA, Landcare Research and universities
- Independent freshwater ecologists
- Local schools and plant nurseries



Keep a watching brief

Monitoring is important! It's easy to get so caught up working on restoration you forget to stop and take stock of your progress, or to keep an eye out for new or unexpected problems.

Top: Aquatic insects are a great indicator of water quality – the WaiCare Invertebrate Field Guide is a useful tool for species ID. Photo: Janet McDonald, Atlas Communications & Media Ltd for Project Twin Streams.

Middle: You'll need to work with experts if you plan on electric fishing, alternatively you could go spotlighting at night. Photo: Robin Black, Hancock Natural Resource Group.

Bottom: Basic equipment is needed to monitor water clarity, temperature, pH, and conductivity. A SHMAK kit (Stream Health Monitoring Assessment Kit) is available for loan from NZ Landcare Trust's Hamilton office. Photo: Monica Peters NZLT.



Aorere: a winning catchment

Making sure their cattle don't taint a \$15 M aquaculture industry at the bottom of their catchment is a major objective of the 33 dairy farmers who live along Golden Bay's Aorere River.

The deep family links and stewardship for the catchment, along with a strong commitment to implementing best management practices on the farm, are key ingredients to their success. In 2002 local shellfish harvest rates were around 28%, today they are up to 79%. See the Aorere Catchment project: www.landcare.org.nz/regional-focus/upper-south-island/aorere-catchment/

River with Dairy cows alongside. Photo: Gretchen Robertson, NZLT.



Want to know more?

Maori and Integrated Catchment Management www.arc.govt.nz

Some great examples of successful catchment scale projects:

Whaingaroa Harbourcare www.harbourcare.co.nz

Motueka River Integrated Catchment Management Project www.landcareresearch.co.nz

Lake Omāpere Integrated Catchment Management www.nrc.govt.nz

Waihao River - Wainono Lagoon Management Strategy www.ecan.govt.nz

Fishy factsheets in this series:

- #1 Our freshwater fish
- #2 Stream works for fish
- #3 Fixing your stream edges
- #4 Native fish in the city
- #5 Native fish on the farm
- #6 Caring for our catchments**

All factsheets can be downloaded from: www.landcare.org.nz

Published by NZ Landcare Trust 2010.

FISH FRIENDLY CATCHMENTS

Best practices to help our native fish survive and thrive

Protect forested headwaters: fencing, pest control and covenants if on private land.

Link mountains to sea: create fish passes to overcome manmade obstacles.

Maintain habitat variety in streams: pools, riffles, runs and meanders.

Plant riparian zones: protects streams from nutrient rich run-off and silt.

Fence waterways and wetlands: prevents stock access.

Covenant special habitats to ensure lasting protection.

Join/start a local streamcare group to restore and protect your streams.

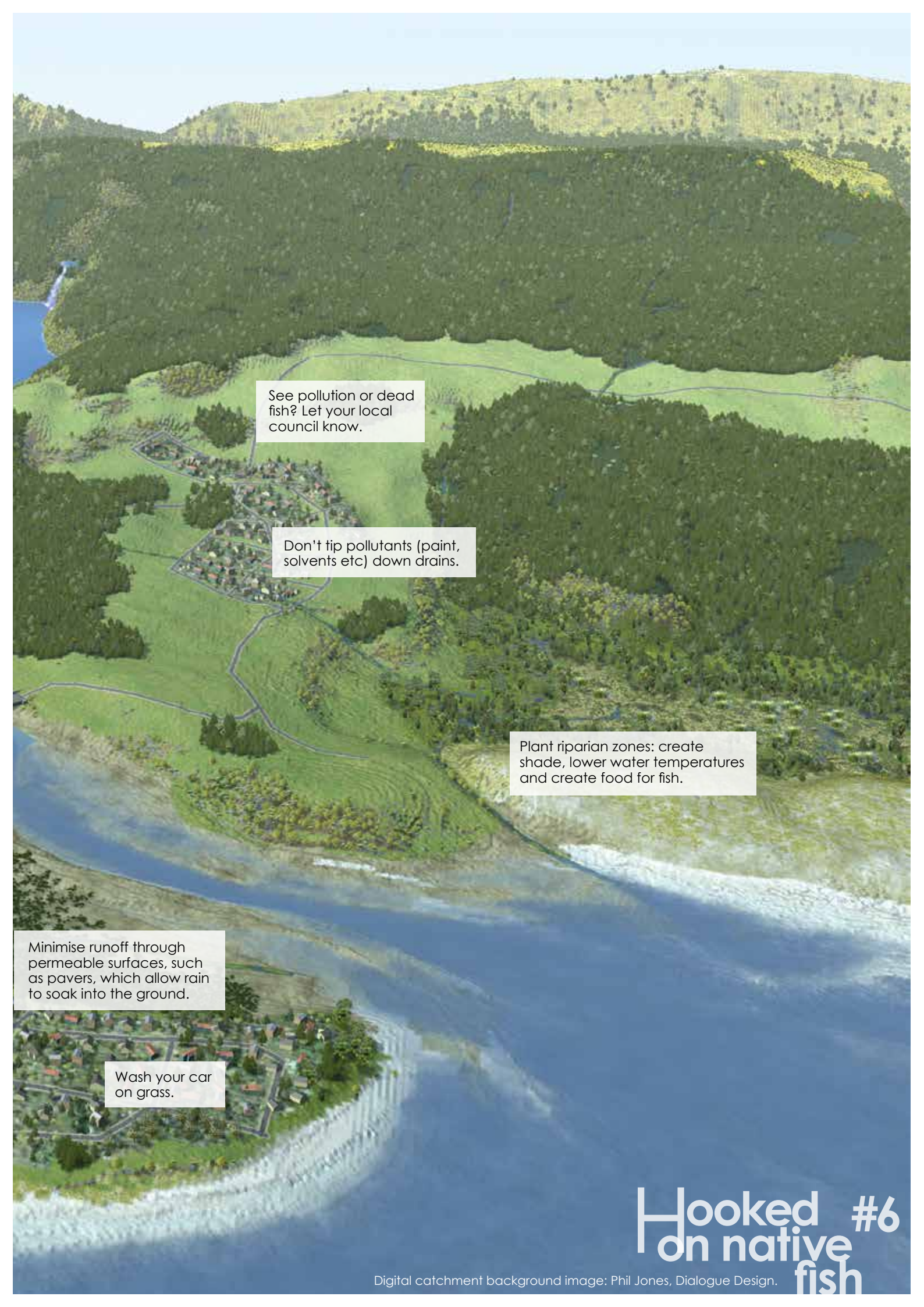
Design or retrofit culverts to enable fish passage.

Establish weirs if water levels are at risk from surrounding drainage.

Consider "soft" engineering approaches e.g. swales, rain gardens, man-made wetlands.

Plant along coastal streams to create whitebait habitat.

Don't tip aquarium fish or plants down drains.

An aerial photograph of a river catchment area. The river flows from the top left towards the bottom right, eventually meeting the ocean. The landscape is a mix of green fields, dense forests, and a small town with houses and roads. The hills in the background are covered in trees and some yellow wildflowers. The sky is clear and blue.

See pollution or dead fish? Let your local council know.

Don't tip pollutants (paint, solvents etc) down drains.

Plant riparian zones: create shade, lower water temperatures and create food for fish.

Minimise runoff through permeable surfaces, such as pavers, which allow rain to soak into the ground.

Wash your car on grass.

Hooked #6
on native
fish

FISH FACT SHEETS IN THIS SERIES:

- #1 Our freshwater fish
- #1 Ngā ika wai māori
- #2 Stream works for fish
- #3 Fixing your stream edges
- #4 Native fish in the city
- #5 Native fish on the farm
- #6 Caring for our catchments

WRITTEN BY:

Karen Denyer, National Wetland Trust

EDITED BY:

Monica Peters, NZ Landcare Trust
Melinda Dresser, NZ Landcare Trust
Nardene Berry, NZ Landcare Trust
Kristy Hall, Boffa Miskell
Bruno David, Environment Waikato

GRAPHIC DESIGN:

Abby Davidson, NZ Landcare Trust

FISH PHOTOS:

Stephen Moore, Landcare Research
Peter Hamill, Marlborough District Council

Published by NZ Landcare Trust 2010

Reprinted 2011

