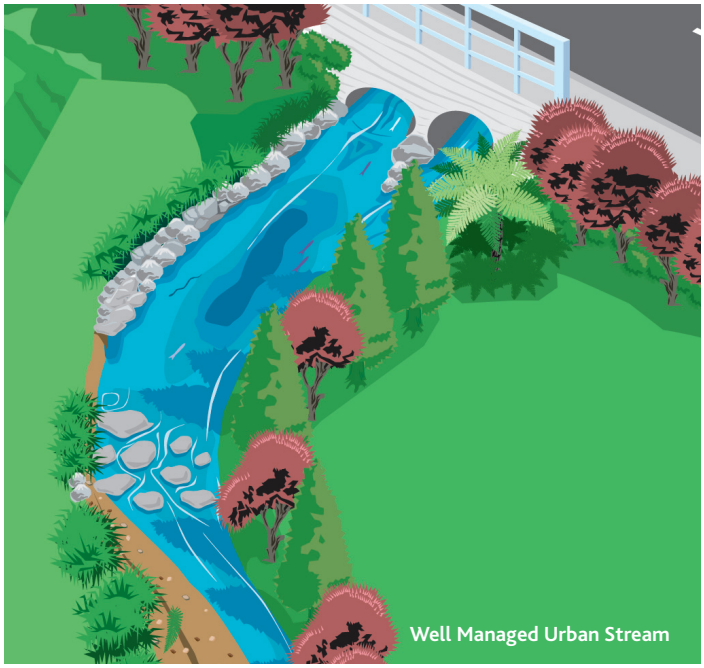
Caring for Urban Streams – Guide 6: Fish passage

Issued by Auckland Council April 2013

This guide forms part of a larger series of documents under the banner "Caring for Urban Streams". To get an overall understanding of the issues related to stream management it is recommended that people read through the complete set of guides, and as a starting point look at the Quick Reference Guide.
If you have any questions about this information sheet please contact Auckland Council on 09 301 0101



Well Managed Urban Stream

Poorly Managed Urban Stream

Streams and the fish that live in them are an essential link between marine and land-based ecosystems, so looking after them has a very real impact on the marine environment.

Over a dozen New Zealand fish species move between the sea, estuaries and freshwater streams and rivers at different times of their lifecycles. They generally swim, climb, jump and worm their way upstream in spring and early summer as juveniles, or move downstream between autumn and spring as adults or larvae. Fish passage can be blocked by very fast flows, shallow water, culverts, pipes, concrete channels, ponds, steep cascades, weirs and waterfalls.

There are some simple solutions for backyard streams which ensure that fish do not get blocked from their journey up or downstream. This guide decribes how to improve fish passage in urban streams.

STREAM SOLUTIONS FOR FISH

Below are several solutions to improve fish passage upstream or reduce impacts on migrating fish.

Good timing. Is it spawning or migration season? If so, put off stream works. Work in streams or areas flowing to streams can cause problems for fish. Work in the stream bed and on banks, and removal of water plants, removes habitat and shelter and causes erosion. Eroded sediment can muddy water dowstream, smother the stream bed and harm stream life.

Clear blockages and deal with obstacles. Are pipes, culverts or channels blocking fish passage? Ideally there should be no drops (sudden changes in level causing small waterfalls, even 10cm drops) and no dry or very shallow sections in pipes or culverts. Culverts and pipes can be designed to allow fish passage – seek professional design advice before installing or altering existing structures in or close to the stream.

For existing pipes and culverts in streams, there are some simple rules.

- If possible, replace culverts and pipes with natural stream bank areas.
- Construct bridges rather than culverts
- Slope box culverts to one side, or form a dish, to create a permanently wet surface.
- In a row of parallel pipes, position one lower than others to carry deeper flows at all times.
- Remove all overhangs, drops and falls on pipes and culverts.
- Set culverts and pipes lower than the natural streambed to carry flows at all times – deep enough so some streambed material collects in the base.
- Angle culvert inlets diagonally to natural flow and include headwalls to create a corner that slows the stream current

- Design culverts and pipes with smooth rounded edges, wet outflow margins and low flow sections.
- Put in a fish ladder, spat rope or rock ramp to fix overhangs.
- Size pipes and culverts to be less than half full in spring (during fish migration season)

Slow flow and reduce steep sections. Do steep sections and fast flow sections of the stream have resting pools? Native fish cannot swim upstream in water flowing faster than one metre per second for any considerable distance and cannot climb long steep sections.

- Slow flows by putting in rough beds – gravels, water plants, woody debris and rocks disrupt fast flowing water.
- Add measures such as baffles or spat ropes on culverts or pipes longer than two metres, to create rest areas.
- Strengthen streambed and banks at downstream edge of culverts and pipes with rocks and boulders to reduce erosion.
- Form outlet pools in streambed using shallow rock weirs – this slows flows and creates resting areas.

Fish passage structures

A single 10cm drop in a stream can block fish making their way upstream to complete their lifecycle. Fish passage structures can bridge drops and create rest areas through fast flows and up long, steep sections. Seek expert advice before putting these in place.

Fish ladders – steps and lower gradient slopes alongside fast flowing steeper areas give fish an easier passage upstream

Spat ropes – climbing fish species can use these to make their way through faster flows and up steep sections

Baffles – formed ridges or knobbled areas on the inside of culverts and pipes slow and spread flows so fish can make their way through.

Backwatering culverts and pipes – set slightly below downstream flows, these always remain wet, have slower flowing water, and collect sediment and woody debris in the base, helping fish passage. Arch culverts that leave the original streambed in place are preferable to box culverts or pipes.

Rip-rap – rocks and boulders placed immediately downstream of a culvert or pipe to stop erosion, formation of drops, and to slow flows.


Fish Barrier – 10cm step in streambed


Fish Barrier – Perched culvert

Maintenance and monitoring checklist

Proper maintenance and monitoring is needed to ensure that your investment has a lasting impact. It is also a great way of getting to know more about the environment.

Maintain

- Replace rocks and boulders at outlets that have shifted after storm flows.
- Check weirs are still forming outlet pools.
- Make sure the downstream end of the culverts sit below downstream streambed level, and remain wet at all times.
- Check fish ramps, ladders, spat ropes and weirs are in good condition.
- Repair slips and erosion at culverts and pipes.
- Leave pebbles, gravel, woody debris and water plants in streambed unless a recent build up has become a flood risk.

Monitor

- Inspect culvert and pipe outlets before the peak fish migration season (spring and early summer) and repair overhangs or other blockages to fish passage where necessary.
- Note new erosion, especially at culvert and pipe outlets, and repair.
- Watch out for several fish congregating downstream of an in-stream structure – this may be because the structure is blocking migration.

Links/Further Information

Further information on stream biodiversity can be obtained by entering the following search terms on internet search engines:

- Auckland Council
- Fish passage
- Culvert barrel design
- Fish passage NIWA
- Fish passage TR2009/084
- Fish passage culverts DOC
- Inlet and Outlet TR

For information on potential fish passage solutions, visit:

www.youtube.com/watch?v=qGuA_zelEjM&feature=related

www.youtube.com/watch?v=QxiwcvmA3uc

http://www.stuff.co.nz/national/videos/3578748

http://www.youtube.com/watch?v=7NYja8ARhzA

http://www.waikatoregion.govt.nz/Environment/Natural-resources/Water/Freshwater-wetlands/Wetland-plants-and-animals/Fish-access/

There are more guides available in this series.
The complete set includes the following:

Caring for Urban Streams
Quick Reference Guide
Guide 1: Flooding
Guide 2: Erosion
Guide 3: Stream water quality
Guide 4: Stream side planting
Guide 5: Stream life
Guide 6: Fish passage

The activities described in this document include some activities that are minor and easy to do, but may also involve significant construction activity such as the use of machinery, moving large volumes of material and extensive changes to the shape and character of a stream. Such activities are likely to require resource consents. Professional advice should always be sought before commencing any work. If in doubt, please contact the Auckland Council stormwater team.

Remember, private landowners are responsible for maintaining the streams passing through or adjacent to their property and for ensuring that any work is done in a legal and safe manner.

For access to this information sheet and to find the other information sheets, search for "Caring for Urban Streams" at www.aucklandcouncil.govt.nz

Auckland Council
Te Kaunihera o Tāmaki Makaurau