Native freshwater fish habitat restoration

CASE STUDY 1

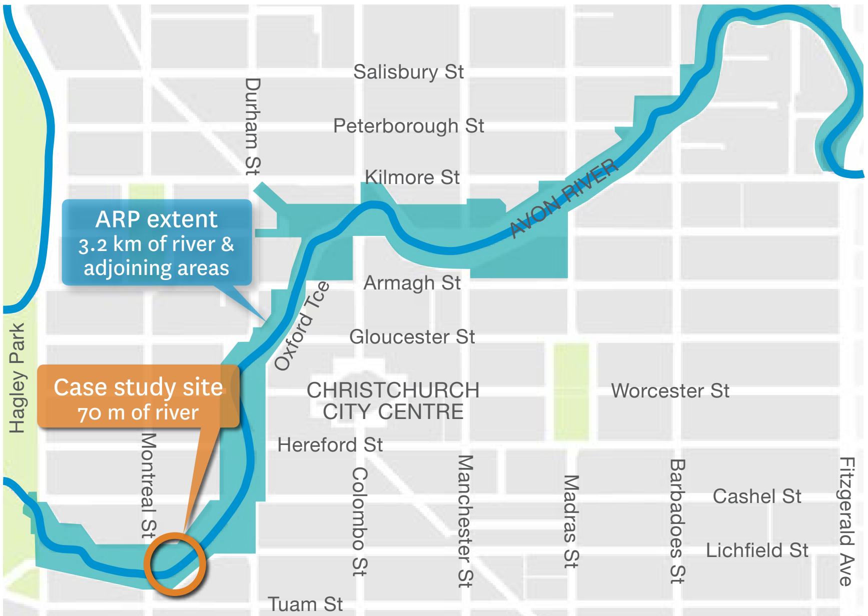
Restoration of riffle habitat
in the Ōtākaro/Avon River

In 2013–15 the Ōtākaro/Avon River in Christchurch underwent in-river and riparian restoration as part of the wider Te Papa Ōtākaro Avon River Precinct (ARP) project. The ARP was part of the rebuild following earthquakes in 2010/11.

Location:

Overall, works were undertaken along a 3.2 km stretch of the 14 km long Ōtākaro/ Avon River. This case study focuses on the 70 m section at Montreal St.

The spring-fed Ōtākaro/Avon River runs through the central city before discharging into the Avon-Heathcote Estuary.



Longfin eels present, but lacked quality habitat

Lots of smothering fine sediment & liquifaction

Objectives:

- Return historically-modified stretches of the River to a more natural state.
- Create 'islands' of clean gravel and riffle habitat (where many of our native fish live and spawn).
- Improve habitat diversity and quality.
- Increase abundance of fish species.
- Provide good habitat for juvenile and adult longfin eels (*Anguilla dieffenbachii*).

All information and photographs provided courtesy of EOS Ecology.

Application

riffle/rapid

gravel substrate

bank/riparian

This case study is part of a series providing information about techniques used to restore native freshwater fish habitat in New Zealand rivers and streams.

Some techniques are still in their trial phase, and not all techniques have been confirmed effective. Resource consent or other permissions may be required to undertake works. We recommend you seek advice before applying any of these techniques onsite.

Department of Conservation
Te Papa Atawhai

Restoration project team:

OPUS city care CERA eos ECOLOGY

Restoration method:


Removed fine sediment

1.

Removed excess fine sediment from the riverbed. This included existing silt and liquefaction from earthquake activity. All sediment was loaded into a truck and removed from the site.


Rescued eels from removed sediment

2.

This site was too deep to use electrofishing in-river before works began, but fish were rescued from the excavated sediment piles. Shallower sections of the river were electrofished to remove fish prior to any works taking place.


Cleaned existing gravel

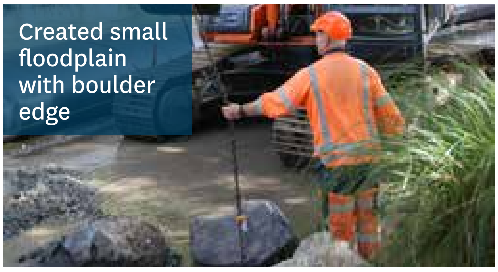
3.

Gravel substrate was cleaned onsite to remove embedded fine sediment. A purpose-built digger sieve (riddle bucket) was developed to clean gravels to a depth of 1 m.


Added extra gravel

4.

The riverbed was built up by constructing a buried weir of larger boulders covered by a cobble/gravel ramp. This increased the channel gradient and supplemented the freshly cleaned gravels already present.


Created small floodplain with boulder edge

5.

A small floodplain was created by building a boulder edge into the channel and backfilling with a mix of soil and gravels. Fish habitat was created by the rough boulder edge, gaps formed between/under boulders, and by adding additional boulder clusters/eel caves in front.


Increased gradient AND narrowed channel

6.

The channel was narrowed and gradient increased to create a fast riffle habitat. Faster flow keeps fine sediment suspended while an upstream pond area acts as a deposition area. The new riffle habitat is suitable for a range of native fish including juvenile longfin eels.


Native planting on floodplain

7.

The small floodplains were planted with low-stature native plants suited to the conditions. The low height of the small floodplains and plants helped to keep a low/neutral effect on flood levels – an important consideration for urban catchments.

Monitoring methods summary:

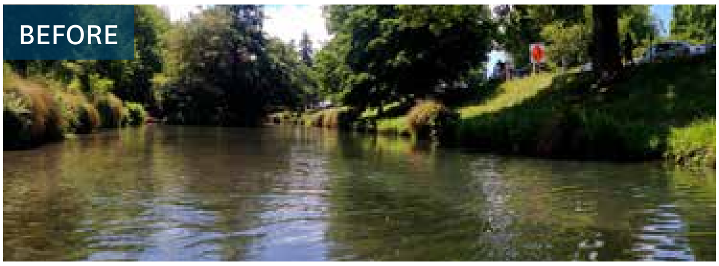
To assess what needs to be improved, and how well the improvement methods are working, a number of monitoring techniques were employed at various stages of the restoration.

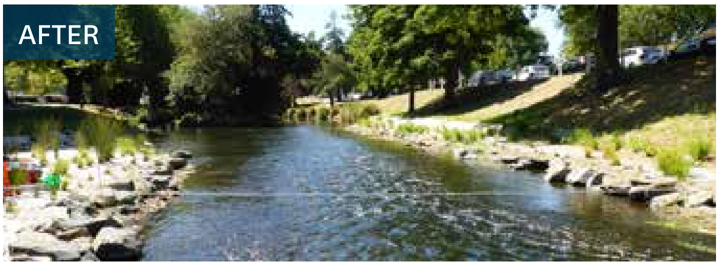
Fish and invertebrate surveys were undertaken at three control sites and four restoration sites. They were done before and after the restoration was completed (between 4–12 months).

More detailed habitat surveys (84 data points per site) were undertaken at one control and three restoration sites. They were done before, and eight times after restoration completion at each site (at 3 and 8 weeks, then 4, 6, 9, 13 and 17 months).


Measuring water velocity

Outcomes:





Detailed habitat monitoring showed that sites with medium-high intervention (including the Montreal St site) had a significant increase in the variation of water velocity and substrate size, a significant increase in overall water velocity and substrate size, and a significant decrease in fine sediment cover and substrate embeddedness following intervention, all of which remained for the 17 months of monitoring. However, for those areas where restoration intervention did not include some form of increasing water velocity (i.e., channel narrowing or increased gradient) the cleaned gravels soon started to silt up again.

Comparison of fish data showed changes in fish abundance at the Montreal St site, with twice the number of fish caught at this site following the restoration interventions and a new species (the native fast-water specialist, bluegill bully (*Gobiomorphus hubbsi*)) being recorded at this site. However, when looking at all fish monitoring sites there weren't any overall significant trends in increased species abundance or numbers. It is possible that any trends regarding changes to the fish population will become more apparent after longer-term assessment. Anecdotally there are now more people going down to the river to feed longfin eels which are now living amongst the boulder edging or in specially built 'tuna townhouses', meaning a greater positive interaction of the community with the river environment.

Despite a large portion of the river undergoing restoration, the river remains unchanged both up and downstream of the ARP section, in a fully urbanised catchment with little treatment of stormwater runoff. This is likely to limit the ability of some fish and invertebrate species to colonise and survive in the intervention reach.

OTHER LEARNINGS:

- Wider catchment conditions will limit restoration success, so catchment-wide improvements are also important. Input of fine sediment and other contaminants from the upper Ōtākaro/Avon River catchment continues to impact restored sections of the river.
- Retaining clean gravels after restoration intervention in waterways with system-wide sediment requires increasing water velocity (channel narrowing and/or gradient increase) in conjunction with gravel cleaning.

FURTHER INFORMATION:

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Published by: Department of Conservation, Freshwater Team,
PO Box 10420, Wellington 6143,
New Zealand | April 2019

New Zealand Government