Native freshwater fish habitat restoration

CASE STUDY 2

Naturalising an artificial channel
in No. 2 Drain, Christchurch

In 2007–08 a 640 m section of the artificial timber and concrete lined No. 2 Drain was naturalised. A specific fast-flowing, stony reach contained bluegill bullies (*Gobiomorphus hubbsi*) – which have a conservation status of 'At Risk, Declining'.

Location:

No. 2 Drain is an artificial waterway, created as part of a network of wetland drainage channels (draining an area of horticultural and agricultural land in the Marshlands area, Christchurch), before flowing through the Christchurch Golf Club course and discharging into Horseshoe Lake. The No. 2 Drain catchment is predominantly between Prestons Rd and Queen Elizabeth II Dr. This case study focuses on the section just upstream of Horseshoe Lake (monitoring sites 1 and 1A).

Objectives:

- Improve habitat to suit bluegill bullies by providing swift, shallow water with a clean stony substrate.
- Reduce long-term maintenance costs.
- Provide stormwater storage and some treatment.
- Enhance amenity value.

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:

Christchurch City Council

eos ECOLOGY

All information and photographs provided courtesy of EOS Ecology.

Restoration method:


Fish removed from channel

1.

Bluegill bullies were captured via electrofishing and removed from the site.


Fish nurtured while works underway

2.

101 rescued bluegill bullies were nurtured in captivity until it was time to return them when the in-channel works had finished.


Removed concrete channel linings

3.

The existing channel linings were removed.


Modified banks

4.

At this case study site steep topography and sandy soils required construction of retaining walls that had flat benched zones to allow riparian planting.


Added coarse substrate

5.

Installed coarse bed material to increase habitat variability.


Riparian planting

6.

Native riparian planting consisted predominately of sedges such as *Carex secta* because most of the project area was within a golf course where taller vegetation was not appropriate.


Upstream works

7.

Further upstream excavation of larger pond areas provided storage for stormwater and acted as sediment traps, reducing the volume of suspended sediment travelling downstream into Horseshoe Lake.

Monitoring methods summary:

- Fish surveys were carried out in 2006 (before naturalisation), and in 2008 and 2011 (six months and 2.5 years after the works, respectively; 2011 also being after the Canterbury earthquakes).
- A total of five sites on the entire channel were surveyed. Four within the whole enhancement project reach, and one control site further upstream.
- Site 1A was only sampled after naturalisation to assess if bluegill bullies had colonised the new habitat created above a culvert.
- Fish were sampled using a Kainga EFM300 electrofishing machine.
- Prior to fishing, each of the monitoring sites were stop-netted at the downstream margin to prevent fish fleeing the survey site.
- Data was presented as a 'catch per unit effort' (CPUE) to standardise the differing sampling methods pre- and post-naturalisation.


Measuring bluegill bullies

Outcomes:

A total of six native fish species were recorded over the course of the study. These were common bully (*Gobiomorphus cotidianus*) (55% of fish captured), shortfin eel (*Anguilla australis*) (17%), upland bully (*Gobiomorphus breviceps*) (13%), bluegill bully (13%), longfin eel (*Anguilla dieffenbachii*) (1%) and īnanga (*Galaxias maculatus*) (1%). There was a significant increase in common and upland bully in 2008 (Sites 1 and 2), six months after the naturalisation works were completed (Figure 1). However, common and upland bully CPUE declined to near pre-naturalisation levels in 2011. This decline indicates that there may have been a short lived boom in either food supply or habitat (or both) before numbers declined to a more stable level. Alternatively, these reductions in 2011 may have been a consequence of changes wrought by the Canterbury earthquakes, such as liquefaction sand smothering the gravel habitat, widening of the channel, and reduction in water velocity.

The bluegill bully population was maintained and they colonised a section of newly created habitat upstream (Site 1A) in the 2008 survey. Prior to naturalisation this section had slow water velocities and a sandy substratum and provided no bluegill bully habitat. There was a decline in bluegill bully CPUE over time after naturalisation at Site 1; however, a greater number of bluegill bully were captured after naturalisation at Site 1. A number of factors could account for this decline in CPUE: the increased difficulty in detecting fish with the addition of instream refuge (rocks, boulders and riparian planting) for bluegill bully to hide in; the occurrence of the September 2010 and February 2011 earthquakes, which altered many of the habitat alterations undertaken to provide optimal bluegill bully habitat (i.e., swift shallow water with a clean stony substratum); and the possible increased competition for food and space as a result of the large increase in the common and upland bully population from 2006 to 2008.

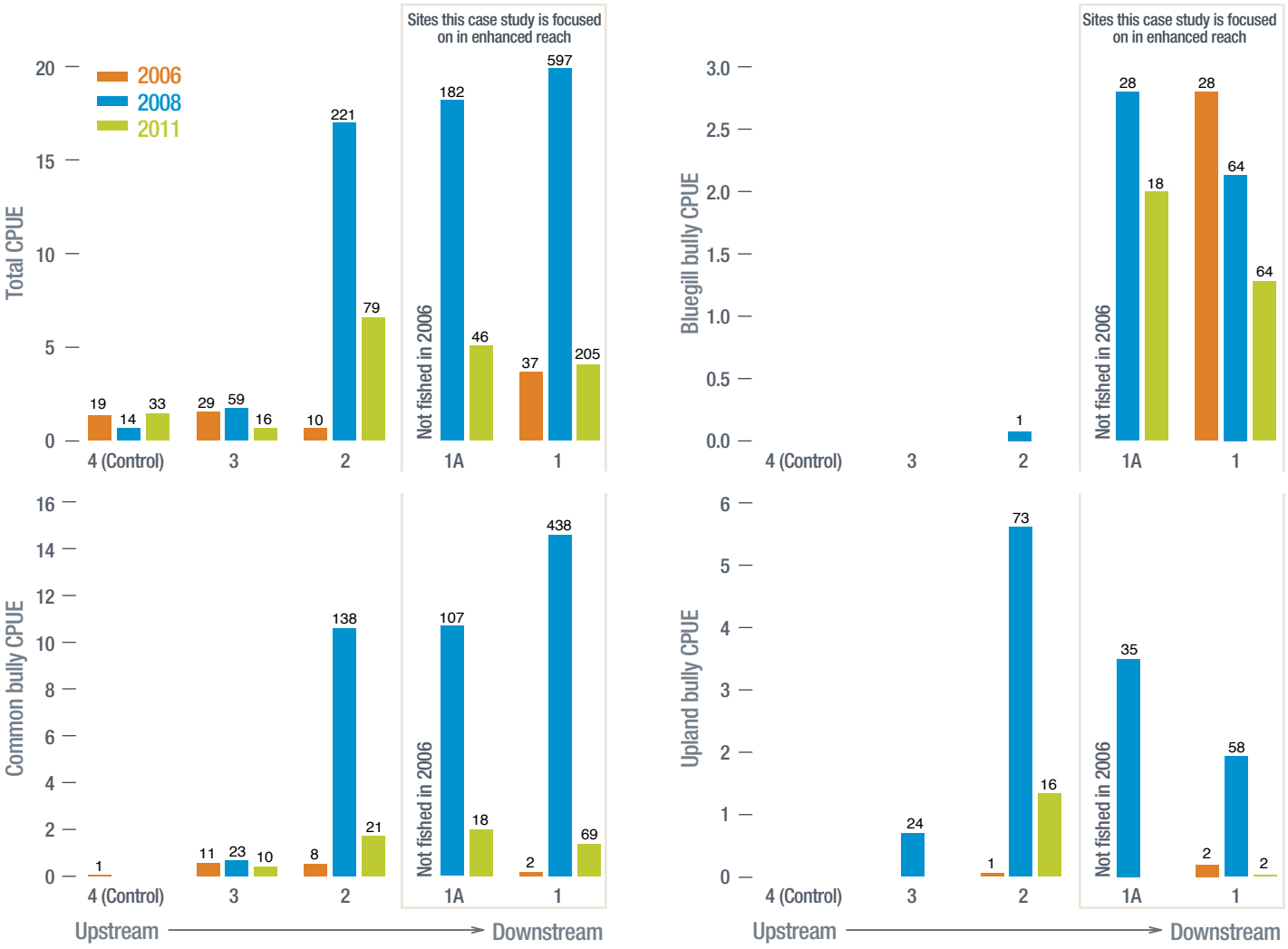

FIGURE 1: Catch per unit effort (CPUE) for bully species captured from each monitoring site (1–4) before (2006) and after (2008 & 2011) naturalisation. 2011 monitoring was after the Canterbury earthquakes. Site 1A was an extra reach which was only sampled after naturalisation. The actual number of fish captured is given above each bar. Source: James (2012).

OTHER LEARNINGS:

- Ongoing maintenance is required to ensure the enhanced habitat remains intact. Earthquake damage changed the channel morphology with bank movement and subsidence causing increased channel width, water depth and reduced flow velocities for much of the reach, as well as siltation by liquefaction. These changes degraded a significant proportion of the habitat specifically designed for bluegill bully.
- Regular monitoring of physico-chemical factors, in addition to biota, is required to ensure that the enhanced habitat functions are working correctly, and to better correlate changes in community composition over time. For example, manipulation of an upstream weir (for wider stormwater management) altered discharges entering this portion of No. 2 Drain, which would have subsequent flow-on effects to habitat and biotic communities.
- Sediment control is required to ensure stony streambed installed during enhancement is not smothered by sediment (where sediment contribution from the upstream catchment is a factor). This is particularly important in sand/silt based and low gradient catchments. This project used a sediment trap upstream of the naturalised section as well as pond areas within the 640 m long enhanced reach.

FURTHER INFORMATION:

Contact Belinda Margetts at Christchurch City Council.

Goodman, J.M.; Dunn, N.R.; Ravenscroft, P.J.; Allibone, R.M.; Boubée, J.A.T.; David, B.O.; Griffiths, M.; Ling, N.; Hitchmough, R.A.; Rolfe, J.R. 2014: Conservation status of New Zealand freshwater fish, 2013. New Zealand Threat Classification Series 7. Department of Conservation, Wellington. 12 p.

James, A. 2012: Ecological Improvements from the Naturalisation of No. 2 Drain. EOS Ecology Report No. 06060-CCC01-02, April 2012. www.eosecology.co.nz/files/No2Drain-Report.pdf

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