

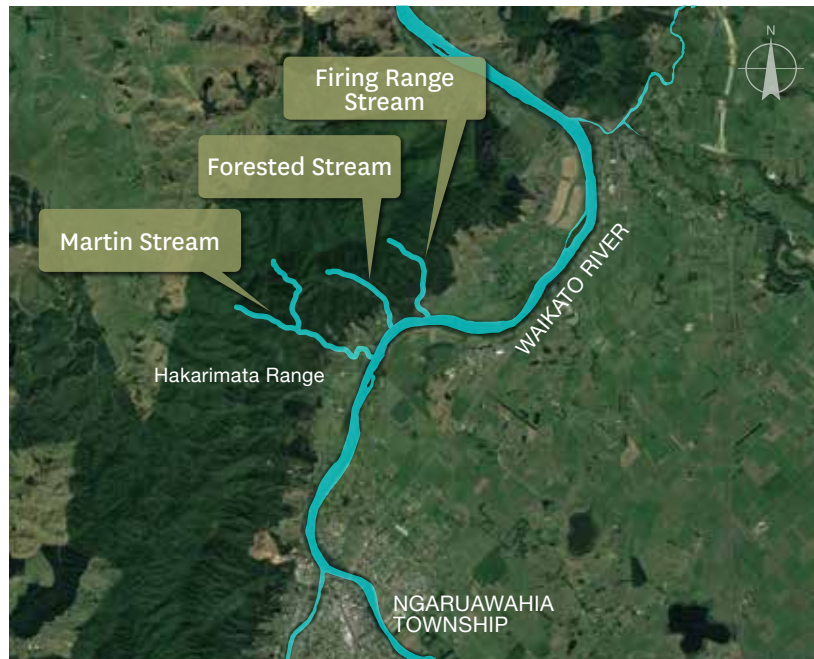
# Riparian habitat enhancement in Hakarimata Streams

The Hakarimata Streams riparian habitat project was carried out by Genesis Energy as part of the resource consent conditions for the operation of Huntly Power Station. They were required to enhance and maintain fisheries habitats on at least two tributary streams of the Waikato River.

## Location:

Forested Stream, Martin Stream and Firing Range Stream - all draining the Hakarimata Range (on the western edge of Ngaruawahia township in the Waikato region).

Hakarimata Range



## Objectives:

- Restoration of the riparian margins of the three streams was required to meet resource consent conditions.
- Before restoration, the lower stream sections flowed through pasture with unrestricted livestock access. Within these pastoral sections a reduction of fish species that rely on riparian vegetation, woody debris, or undercut banks to provide cover was evident.
- Resource consent conditions required fish populations be surveyed to determine if the following objectives had been met:
  - the abundance of indigenous fish had increased by 50% or more, or
  - one additional significant indigenous species had become established as a viable population.

## Application



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.

## ► Restoration method:

The enhancement works carried out in 1995/96 included:

1. Construction of fences to retire the streams from grazing.
2. Provision of fish passes at existing culverts (where necessary).
3. Planting of indigenous species to create shade along the streams and to enhance existing habitats.
4. Streams were also assessed to ensure that there was unhindered fish passage along the stream length.

### IN TOTAL:

- **five** bridges were constructed
- **12 km** of fences were erected to exclude livestock from the forest and streambed
- **12** stock-water troughs were installed to provide livestock with water
- **over 10,000** trees and shrubs were planted along the pastoral riparian margins to re-establish a forest corridor (approximately 4 m width on each bank) between the pastoral sections and the native forest headwaters.



## ► Monitoring methods summary:

Resource consent conditions required fish populations to be surveyed prior to and after enhancement to determine if all objectives had been met.

Multipass electrofishing surveys were carried out in 1995, 2003, 2005 and 2016, with the 1995 survey representing the pre-enhancement condition, and the latter surveys assessing fish populations after 8, 10 and 20 years of riparian establishment. Most recent monitoring has largely been focussed on two streams (Martin Stream and Forested Stream) due to access problems with the third site.



## Outcomes:

By 2005, the restoration efforts were deemed successful (Figure 1) with the total abundance of species associated with forested streams or streams containing good riparian cover (giant kōkopu (*Galaxias argenteus*), banded kōkopu (*Galaxias fasciatus*) and redfin bully (*Gobiomorphus huttoni*)) all having increased by 50% or more. In addition, lamprey (*Geotria australis*), a culturally important taonga species, had become established in two of the restored streams.

After 20 years (2016), the continued high abundances of banded kōkopu and redfin bullies indicated that the riparian restoration works have continued to provide good quality habitat in the lower sections of the streams (Figures 2A & 2B). Longfin eel (*Anguilla dieffenbachii*) abundances have also been maintained or increased compared to previous surveys, which provides further evidence that as the

riparian and canopy cover has become self-sustaining it is continuing to support valuable and viable fish communities.

In Martin Stream, the decline of īnanga (*Galaxias maculatus*), smelt (*Retropinna retropinna*) and common bully (*Gobiomorphus cotidianus*) in 2016 was thought to be the result of the perched culvert in the lower section of the stream (under Hakarimata Road) rather than a reduction or loss of suitable habitat. Erosion at the culvert outlet has created a barrier to migratory fish species (Figure 3), limiting access for swimming fish species unable to climb the wetted margins of obstacles.

The absence of giant kōkopu in Forested Stream during 2016 is likely to be because fish had moved out of the survey reaches in search of more favourable habitat, as low summer flows had resulted in a decline of the deep pool habitat preferred by this species.



FIGURE 1: Martin Stream before and after the enhancement works

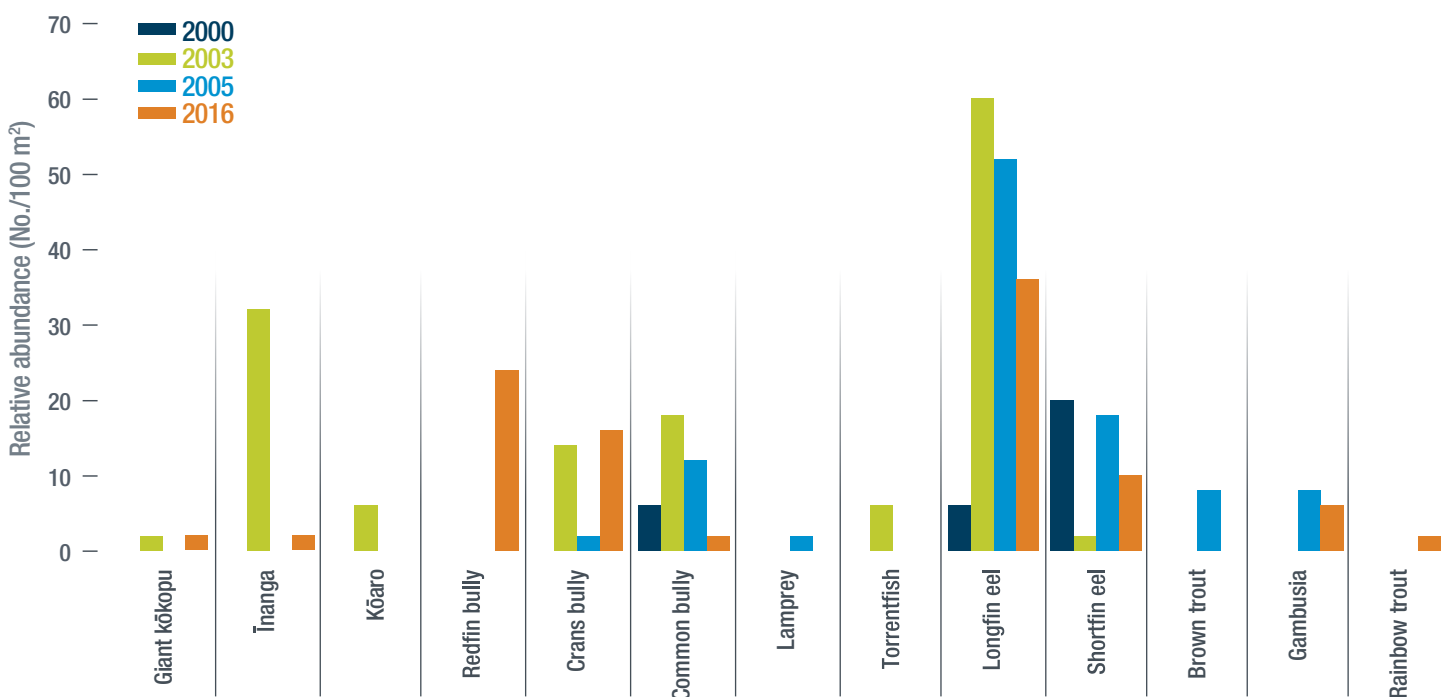


FIGURE 2A: Martin Stream – Abundance of fish species (2000–2016)

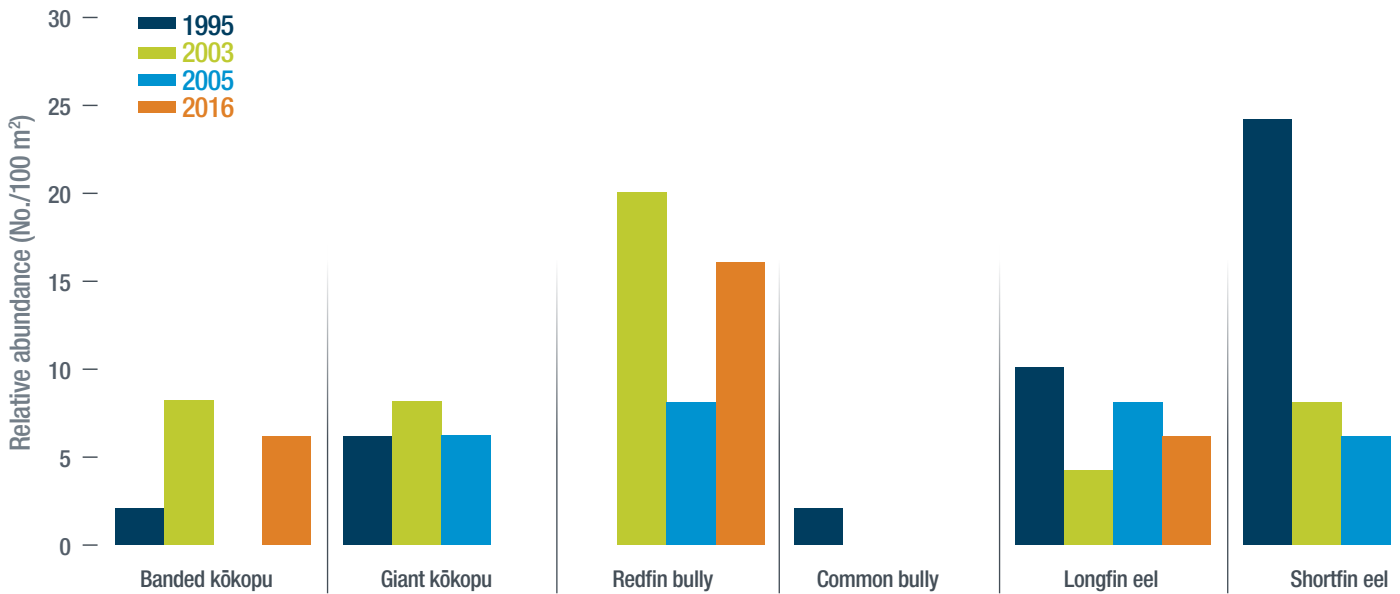


FIGURE 2B: Forested Stream – Abundance of fish species (1995–2016)



photo © NIWA

FIGURE 3: Perched culvert in the lower reaches of Martin Stream under Hakarimata Road

#### OTHER LEARNINGS:

- On the small streams restored, the riparian rehabilitation was successful in enhancing fish species that prefer overhead and instream cover. Although not specifically assessed, the riparian rehabilitation is likely to reduce water temperatures, improve invertebrate food supply and reduce erosion and inputs of fine sediment from the exclusion of livestock, and stabilisation of the stream banks.
- In order to maintain diadromous fish populations, access to habitats is just as important as habitat provision itself. Although the council-owned culvert under Hakarimata Road (Figure 3) is downstream of the enhancement area, erosion at the outlet has decreased the abundance of swimming fish species (e.g., īnanga, smelt and common bullies) in the restored habitats. This highlights how other stressors in the wider catchment can impact on maintaining populations of migratory fish species after the development of self-sustaining riparian vegetation.
- Careful consideration should be given to site selection as subsequent access problems can prevent the stream maintenance necessary to ensure success of the restoration initiatives.

#### FURTHER INFORMATION:

Contact Cindy Baker (Cindy.Baker@niwa.co.nz)

David, B., Hamer, M. (2010) Regional guidelines for ecological assessments of freshwater environments: Standardised fish monitoring for wadeable streams. Environment Waikato Technical Report. No. 2010/09:31.