Native freshwater fish habitat restoration

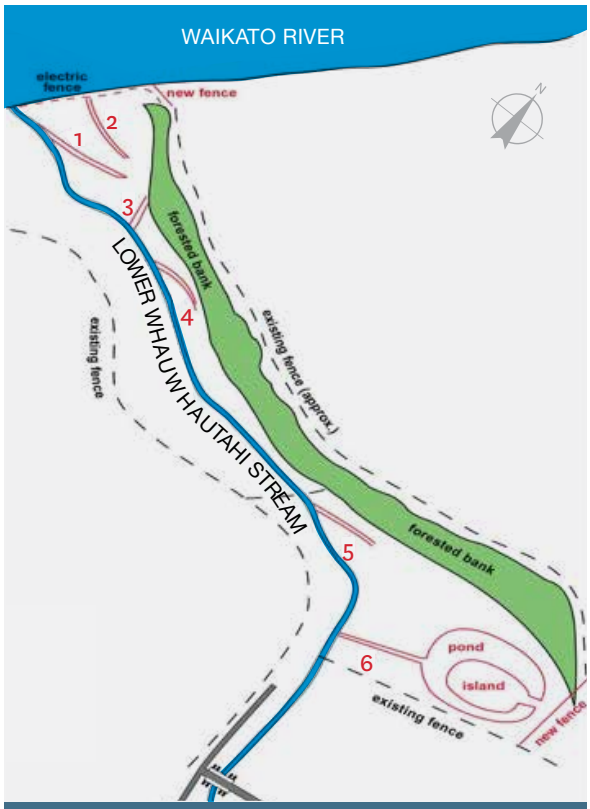
CASE STUDY 3

Intertidal habitat enhancement
on the lower Waikato River

Although īnanga (*Galaxias maculatus*) have a nationwide distribution, many of the habitats required for critical life stages (i.e., spawning, juvenile and adult rearing) have been affected by urban and rural development. In particular, spawning habitat has been identified as a critical bottleneck for the restoration of īnanga populations.

Location:

Enhancement took place at the intertidal riparian section of the lower Whauwhautahi Stream, a tributary of the lower Waikato River.



Layout of enhancement area in the Whauwhautahi Stream. Enhanced areas are shown in red with channel numbers indicated.

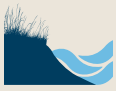
Objectives:

- Īnanga spawn in riparian vegetation when it is inundated during high spring tides. Peak spawning usually occurs near the upper limit of the saltwater wedge, but also extends to the upper limit of tidal influence. Spawning habitat has been severely damaged by agricultural development and drainage maintenance along both banks of the lower Waikato River – so the Whauwhautahi tributary was chosen as a site to carry out restoration works. In order to sustain īnanga populations there is a need to protect intact spawning habitats, and restore sites which have been impacted by land use and riparian management changes.
- As part of the resource consent conditions to operate Huntly Power Station, Genesis Energy carried out fish habitat enhancement. The aim of the enhancement works was to provide effective spawning and rearing habitat for īnanga.


Īnanga eggs

photo © EOS Ecology / Shelley McMurtrie

Application


bank/riparian


intertidal

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:

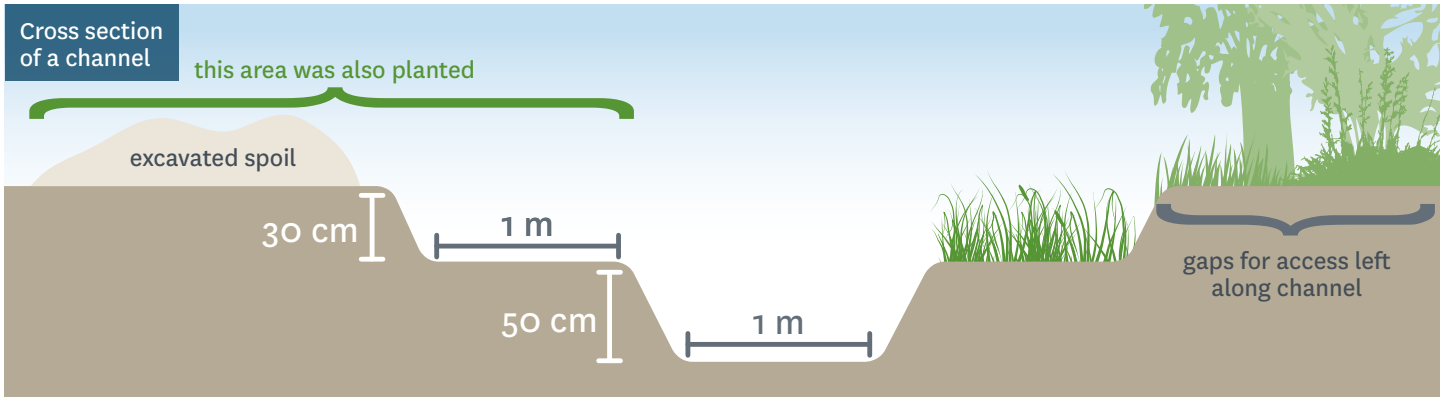
NIWA Taihoro Nukurangi

genesis

Funding for restoration works & monitoring was provided by Genesis Energy Limited.

Restoration method:

Historically īnanga spawning at this site was known to be significant, but habitat had declined over time. Before the enhancement took place, no īnanga eggs were found at the site in 2003, nor were any found in previous surveys undertaken in the 1990s. Between 2003 and 2005, the following enhancement works were carried out:



1.

The area was fenced so that any īnanga eggs deposited on site would not be trampled by cattle.

2.

Indigenous trees, shrubs and grasses were replanted to provide cover and food for fish.

3.

Channels and ponding areas were created to increase fish habitat and improve access to spawning and feeding areas on the tide-flooded river margin (see map on front page).

4.

Sloping banks were created to provide areas where īnanga could once again spawn.

5.

Weeds were removed, eventually to be replaced by indigenous plants.

7.

Annual maintenance of the spawning grounds was undertaken between 2005 and 2012 to ensure the habitat remained suitable for īnanga spawning and rearing. Maintenance consisted of weed control (chemically and by hand), inspection of fences, possum control, minor vegetation removal, staking and tying of plants as necessary, and replacement planting.

Monitoring methods summary:

The restored site was assessed eight times for īnanga eggs (2006 to 2014, excluding 2007). In addition, a survey of adult īnanga was also undertaken in 2009 and 2010 (Baker et al. 2010).

Outcomes:

The initial assessments in 2006 and 2008 indicated that the channels and the pond were utilised by īnanga, with evidence of spawning found along the margins of channels 1 and 2 during autumn 2008 (Baker et al. 2010). In 2009 and 2010, large numbers of ripe īnanga were present at the site, with īnanga eggs located along the margins of channel 2 during autumn 2010. Between 2011 and 2014, no further spawning was evident at the site.

In assessing the vegetation along the channel margins, channel 2 was considered to provide the best spawning habitat within the enhanced area and was the main channel utilised by īnanga in 2008 and 2010. The spawning habitat was provided by a blanket growth of wandering willie (*Tradescantia fluminensis*). The native plantings of grasses and sedges alongside the channels proved difficult to maintain and may have been shaded out in summer by willows and elders as they were quickly out competed by wandering willie.

Patches of exotic vegetation were also deemed suitable for spawning along channels 1, 3 and 4. However, erosion was evident at channel 1, which had led to steep sided channels. As such, inundation of suitable spawning habitat was limited to high river levels and high spring tides.

Rank grasses were the dominant riparian plant along both channels 5 and 6. Although rank grasses can provide good īnanga spawning habitat, evidence of chemical control was apparent and the grasses were sparse along the intertidal margins of the channels. Therefore the habitat was not considered suitable for īnanga spawning and no evidence of spawning was found along these channels in any survey.

By 2010 the riparian vegetation in the pond area was well established, but the pond itself was choked with dense macrophyte growth, and mosquitofish (*Gambuisa affinis*) were abundant. During periods of low river levels and lower tide heights, the pond was not inundated on the high tide. Overall, the pond area was no longer considered to provide good īnanga rearing or spawning habitat.

Overall the surveys showed that large numbers of ripe īnanga were present at the site and that spawning occurs when river levels and tides are suitable to inundate the available habitat. The exotic plant wandering willie was found to be the preferred spawning vegetation not only within the enhancement site, but also at many other lower river sites.

OTHER LEARNINGS:

- The primary spawning habitat for īnanga was created alongside channels 1 and 2, however, the native vegetation planted (grasses and sedges) did not successfully establish due to competition from invasive species. Although it is preferable to establish a mix of exotic and native vegetation, many invasive species do provide good spawning habitat for īnanga, as evidenced by īnanga eggs found amongst wandering willie at this site.
- Ensuring all channels have a high degree of water exchange over a wide range of tidal heights is important for providing rearing habitat for īnanga. The elevation of channel 6 did not maintain adequate flushing flows into the pond area, which resulted in dense macrophyte growth, an abundance of mosquitofish and the loss of īnanga from this habitat.

FURTHER INFORMATION:

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Baker, C.F. (2010). Huntly Power Station – 2010 fisheries monitoring report. NIWA Client Report HAM2008-174. NIWA, Hamilton

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