Lessons Learnt 001

Installation of a fish ramp and baffles to restore fish passage at a perched culvert

This case study forms part of a series that provides key information and guidance about how to potentially improve a fish passage barrier in a New Zealand waterway.

While providing fish passage is advantageous to most fish, removing or remediating a barrier can also affect fish populations by introducing invasive species to new areas.

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<thead>
<tr>
<th>What was the problem?</th>
<th>What was the solution?</th>
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<td>Several indigenous fish species were excluded by a perched concrete culvert in Bankwood Stream, Hamilton (1.5 m diameter; 73.8 m length; gradient 0.3–2.55°). The barrel water velocities were also too high to permit upstream passage for swimming fish, such as inanga (Galaxias maculatus) and common smelt (Retropinna retropinna).</td>
<td>We initially installed a fish ramp at the outlet of the pipe culvert. The ramp was made of concrete, embedded with cobbles and angled horizontally (5°). It is 16 m long, 0.9 m wide and has a slope of 5.7°. A receiving pool (approximately 2 m x 2m) was installed at the top of the ramp.</td>
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<td>Declines in indigenous fish species, such as inanga and common smelt, are a significant concern for local communities in the catchment.</td>
<td>Monitoring showed that the fish ramp alone did not provide passage for the target species because of high water velocities in the culvert. In response, we installed spoiler baffles within the culvert.</td>
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<td>We considered protection and restoration of access to upstream habitats a priority, as the whitebait fishery is of cultural and recreational importance. Our key aim for this work was to restore upstream passage for non-climbing fish species.</td>
<td>Thirty six UV stabilized polyethylene spoiler baffle sheets (2 x 0.9 m) with baffles (0.25 x 0.10 x 0.12 m) spaced 0.10 m apart laterally and 0.25 m longitudinally were secured to the culvert base with 5 mm dynabolts and 20 mm stainless washers. Baffles were configured in alternating offset rows of 3–4 baffles.</td>
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*Success rating: 5/5 – Excellent. Improved passage for all target species.*
Monitoring results

Monitoring showed that installation of a ramp allowed common bully passage upstream, and the ramp and baffles enabled juvenile banded kokopu, smelt and inanga to migrate upstream (Figure 1).

Did it work?

Installation of a fish ramp and spoiler baffles at a pipe culvert can overcome migration barriers for weak swimming fish, such as inanga and common smelt, under low-flow conditions and can enhance the composition of the upstream fish community.

Lessons learnt

1. Outcome monitoring is critical as it was found that installing a fish ramp alone did not provide passage for the target fish species.

2. This remediation configuration could be used successfully for other structures with similar characteristics and dimensions, and can probably be adapted to other sizes. In this particular location, the baffle sheets should have been secured better and ideally they should have been another block wide.

3. The receiving pool at the downstream end of the culvert needs to be large enough to provide resting areas for fish and dissipate energy without causing turbulent conditions unsuitable for fish.

For further information

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Reference: