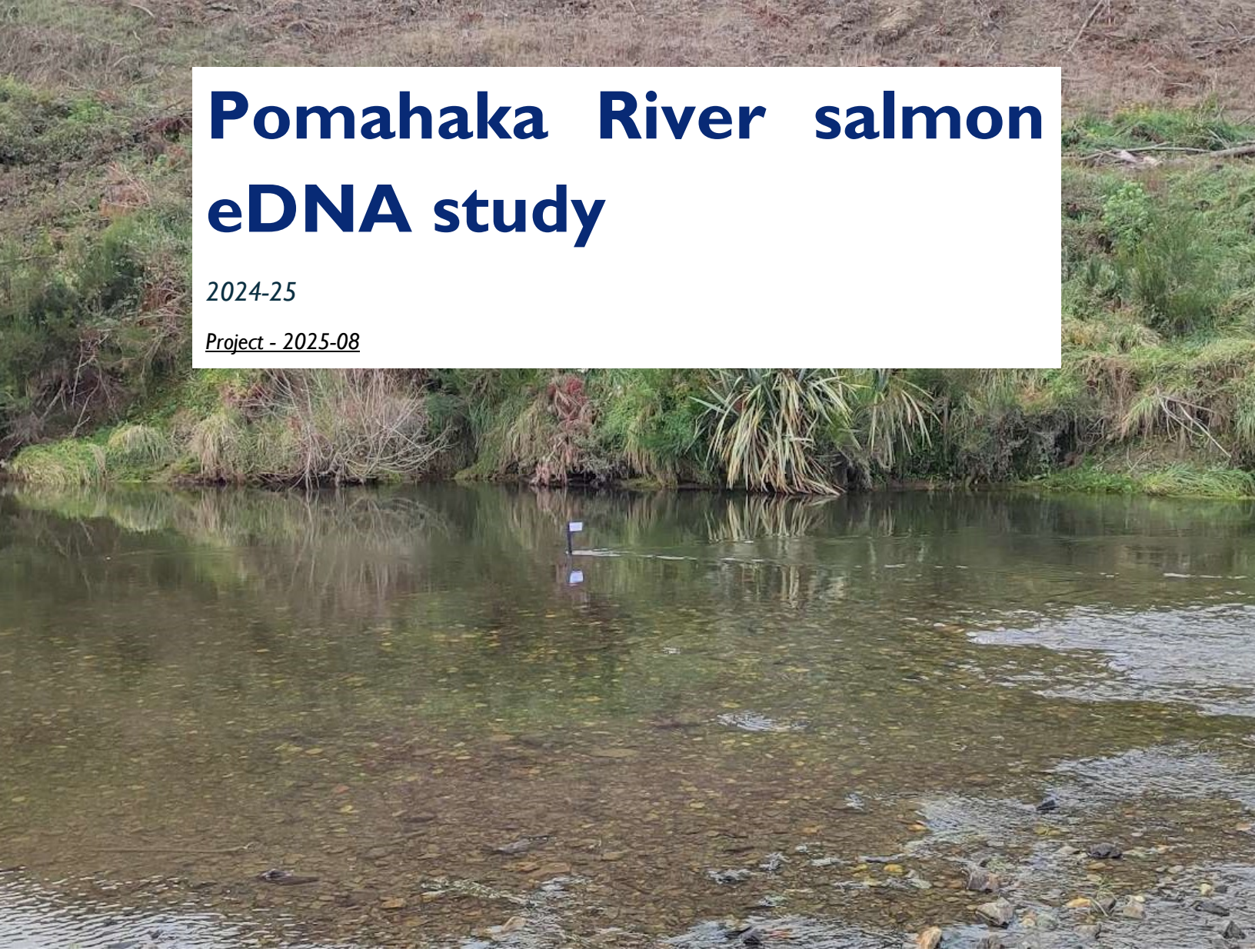

Pomahaka River salmon eDNA study

2024-25

Project - 2025-08

JULY 2025

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1. Executive Summary

The Pomahaka River catchment is a historically significant spawning area for Chinook salmon, but recent information on this population is limited. This report details the findings of an environmental DNA (eDNA) survey conducted in late May 2025. The primary objective was to determine the presence of Chinook salmon and characterise the wider fish community across eight sites in the Pomahaka, Waipahi, and Leithen waterways.

The survey did not detect any Chinook salmon DNA at any of the sites. It did, however, confirm the widespread presence of brown trout and longfin eel. The analysis also verified that the catchment continues to provide important habitat for other native species, including lamprey (kanakana) and a complex of galaxiids. As a secondary measure, a brief assessment of ecological health using the Taxon Independent Community Index (TICI) indicates this was generally 'good' to 'excellent'.

The key conclusion from this work is that the 2025 Chinook salmon run in the Pomahaka catchment was likely negligible or non-existent.

2. Introduction

The Pomahaka River catchment, a major tributary of the Mata-Au (Clutha River), is historically significant for its salmonid populations. The Pomahaka River and its tributary, the Leithen Burn, have in the past been recognised as two of the main spawning areas for lower Clutha Chinook salmon (*Oncorhynchus tshawytscha*), but recent spawning records are limited. These waterways also provide important habitat for both resident and sea-run brown trout (*Salmo trutta*). Anecdotal accounts also suggest historical salmon spawning in the nearby Waipahi River, but official records could not be found.

This study uses environmental DNA (eDNA) analysis, a sensitive and non-invasive technique that can detect species from genetic material present in water samples. While eDNA analysis does not confirm spawning activity or fish abundance directly, its high sensitivity makes it an effective tool for verifying species presence and providing insights of abundance.

This report presents the findings from an eDNA survey conducted in late June 2025 at eight sites across the Pomahaka, Waipahi, and Leithen waterways. The primary objective was to detect the presence or absence of Chinook salmon. Secondary objectives were to characterise the broader aquatic biological community and assess stream health using the Taxon Independent Community Index (TICI). This broader ecological data provides context for the salmon survey results. These findings will help inform fisheries management and guide potential habitat restoration efforts within the catchment.

3. Methodology

Environmental DNA (eDNA) samples were collected from eight sites. This included: six sites on the Pomahaka River, one site on the Waipahi River, and one site on the Leithen Burn (Figure 1).

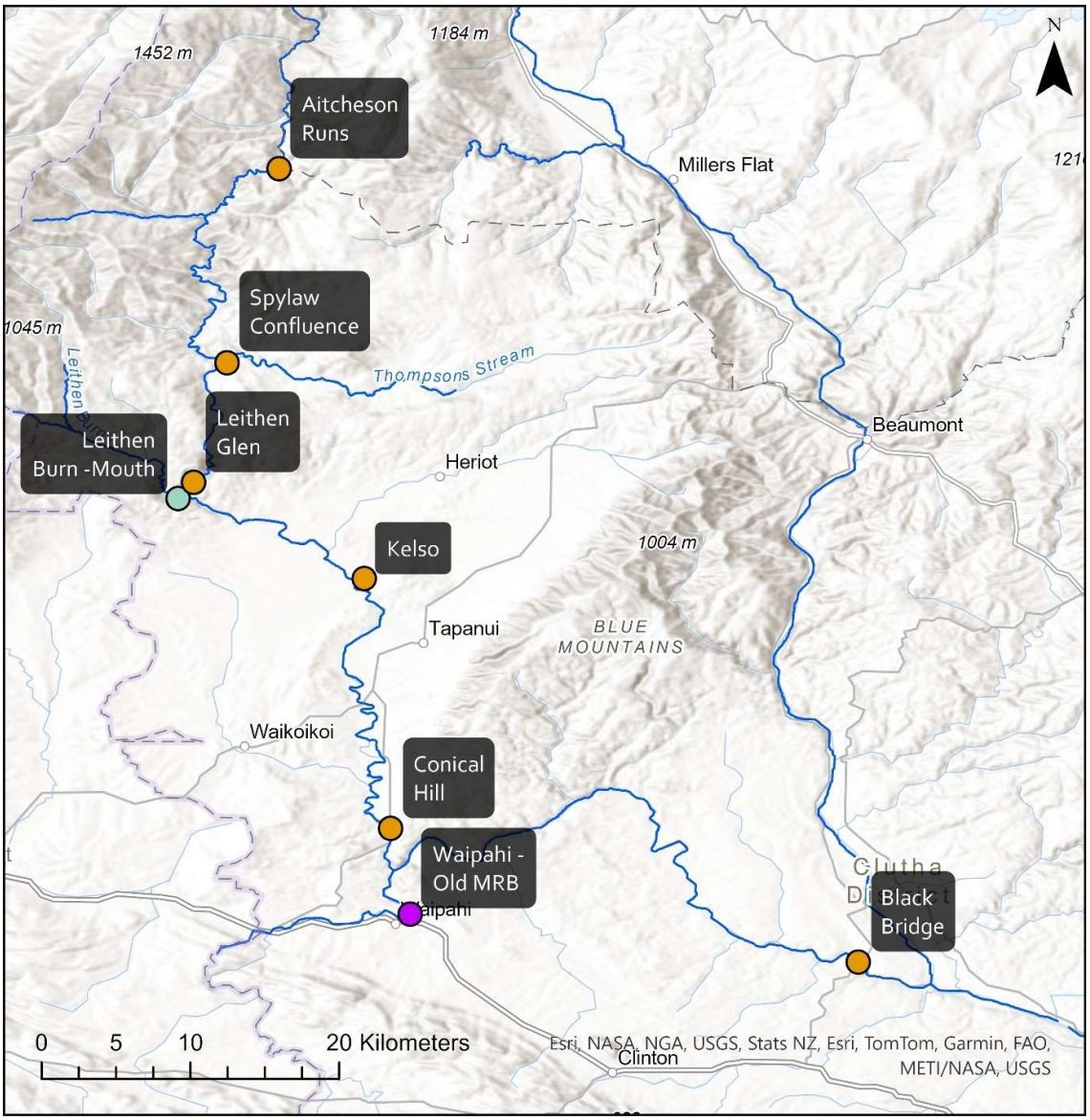

Figure 1: Map showing eDNA sample locations.

Sampling was conducted on 26 May 2025. This date was selected as it fell between planned aerial spawning surveys. The river had cleared following a minor fresh and it was before a forecast flood event, which provided a suitable window for sampling. At each site, triplicate Wilderlab (Wilderlab NZ Ltd n.d.) passive drogue-type eDNA samplers were deployed on manifold kits at least 5 cm below the surface on waratahs. for a 24-hour period (Photo 1). This method was chosen over mini syringe kits to improve the chance of detection. All field sampling and sample handling followed Wilderlab's standard protocols.

Photo 1: A typical eDNA deployment, in the lower Leithen Burn. Inset- Manifold examples.

Following collection, all samples were sent to Wilderlab for analysis using their comprehensive freshwater panel. This analysis provides a broad assessment of the biological community, including vertebrates, invertebrates, plants, and microbes. A species was regarded as 'present' at a site if its DNA was detected in one or more of the three replicate samples.

The analysis generated Wilderlab Taxon Independent Community Index (TICI) score for each site. TICI is a metric of ecological health developed in New Zealand specifically for eDNA data (Wilkinson et al. 2024). It provides a holistic assessment by using the DNA signature from the entire community—including microbes, fungi, and animals—rather than relying only on the presence of specific indicator insect species as the traditional Macroinvertebrate Community Index (MCI) does. To investigate spatial trends in stream health, linear regression analysis was performed to model the relationship between the TICI score and each site's distance from its respective headwaters. This approach allows for a standardised comparison of downstream trends between the main river and its tributaries.

All raw data from this project were made publicly available on the Wilderlab website, (wilderlab.co).

4. Results

4.1. Species Present

The eDNA analysis detected a total of eight freshwater fish species across the eight sites sampled. The analysis did not detect the target species, Chinook salmon (*Oncorhynchus tshawytscha*), nor rainbow trout (*Oncorhynchus mykiss*) at any of the eight sites.

Brown trout (*Salmo trutta*) was the most widespread sports fish, detected at all eight sites across the catchment. Perch (*Perca fluviatilis*) was the other sports fish detected, at two sites, both on the Pomahaka River (Table 1).

Two native eel species were present. The longfin eel (*Anguilla dieffenbachii*), classified as 'At-Risk–Declining'(Dunn et al. 2018), was detected at all eight sites. In contrast, the shortfin eel (*Anguilla australis*) was found only at the Waipahi River site. Other native species detected included the upland bully (*Gobiomorphus breviceps*), found at seven sites, galaxiid species at six sites (see below), and the "Nationally Vulnerable" (Dunn et al. 2018) lamprey (*Geotria australis*, or kanakana), which was detected at four sites, all in the lower catchment (Table 1).

The native galaxiid community within the Pomahaka catchment is known to be complex. Recent genetic studies have identified at least two distinct, non-migratory lineages: a flathead species, referred to as *Galaxias* "*Pomahaka*", and a newly identified roundhead species, *Galaxias* "*species Z*". *G. Pomahaka* specimens have previously been found in upper tributaries, including Parasol and Valley Creeks, while *G. species Z* has been found lower in the catchment in Thompsons Creek, Flodden Creek, Heriot Burn, and widely in the Waipahi catchment (Olsen 2024).

This taxonomic complexity presents a challenge for eDNA analysis, as commercial laboratory reference databases take time to incorporate the latest genetic discoveries. As our knowledge of species' genetic signatures improves, Wilderlab classifications are continuously updated (M Court, pers. comm., 2025). For instance, the analysis identified DNA assigned to the Southern flathead galaxias (*Galaxias 'southern'*), but this could potentially be a misclassification of the closely related and recently distinguished *G. 'Pomahaka'*. The analysis also detected DNA from a broader galaxiid group that could not be resolved to a specific species, as the genetic markers are very similar between the Clutha, Taieri, and Pomahaka flathead species.

For clarity in Table 1, these results have been simplified. Detections assigned by the laboratory to the specific species are listed as 'Southern flathead galaxias', while the unresolved detections are presented as 'Other Galaxiid'.

Table 1: Presence (✓) of fish species detected via eDNA analysis at eight sites in the Pomahaka catchment, June 2025.

Waterway	Site	Shortfin eel	Longfin eel	Southern flathead galaxias	Other Galaxiid	Lamprey	Upland bully	Perch	Brown trout
Waipahi River	Old MRB	✓	✓			✓	✓		✓
	Black Bridge		✓			✓	✓	✓	✓
	Conical Hill		✓		✓	✓	✓	✓	✓
	Kelso		✓		✓	✓	✓		✓
Pomahaka River	Leithen Glen Confluence		✓	✓	✓		✓		✓
	Spylaw confluence		✓		✓		✓		✓
	Aitcheson Runs		✓		✓		✓		✓
Leithen Burn	Mouth		✓		✓		✓		✓

4.2. Taxon Independent Community Index (TICI)

Taxon Independent Community Index (TICI) scores, which indicate ecological health, were calculated for each of the eight sites. The mean scores ranged from a high of 118.2 at the uppermost Pomahaka River site (Aitcheson Runs) to a low of 101.3 at the Waipahi River site.

According to Wilderlab classifications, sites were rated as having 'good' or 'excellent' ecological health. The Waipahi River and the three lower-catchment Pomahaka River sites rated as 'good' (TICI scores 100–110), while the Leithen Burn and the three upper Pomahaka sites rated as 'excellent' (TICI scores 110–120). The Aitcheson Runs site score of 118.2 was just below the 120-point threshold for 'pristine' condition.

A linear regression analysis revealed a strong, significant negative correlation between a site's distance from its headwaters and its TICI score ($p < 0.001$, $R^2 = 0.91$), indicating that TICI declined at sites further downstream (Figure 2). While most sites on the Pomahaka River main stem followed this trend, the tributary sites deviated. The Leithen Burn site scored

slightly below the trend line, and the Waipahi River site was a clear outlier with a TICI score substantially lower than predicted by the model for its location.

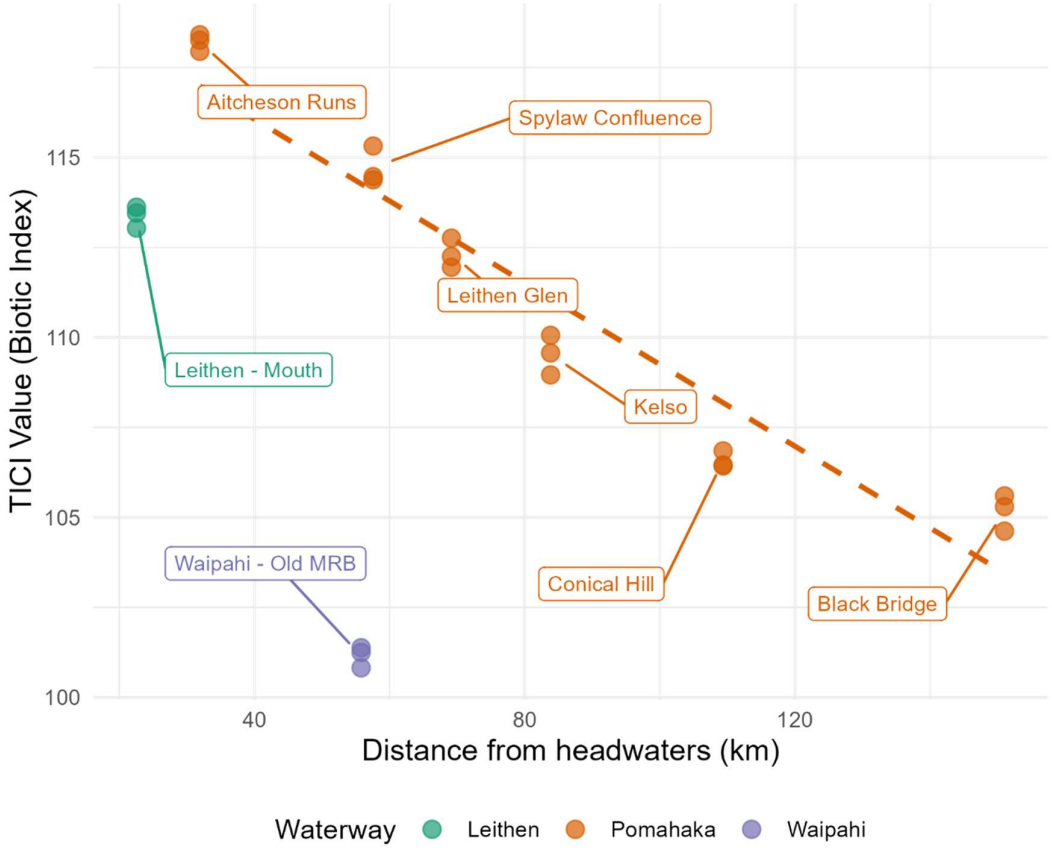

Figure 2: Relationship between ecological health (TICI score) and distance from headwaters (km) for eight sites in the Pomahaka catchment, June 2025. Points represent the TICI scores for each site/ replicate and the solid line represents the linear regression model

5. Discussion

5.1. Chinook Salmon Presence

The primary objective of this investigation was to determine if Chinook salmon were present and potentially spawning in the Pomahaka catchment. The eDNA survey did not detect salmon DNA at any of the eight sites on the Pomahaka, Waipahi, or Leithen waterways. This finding contrasts with separate helicopter spawning surveys, where a single potential salmon redd was observed on a gravel bar approximately 12 km upstream from our nearest downstream eDNA site at the Spylaw Burn confluence (Couper 2025).

Neither survey method is perfect. It is possible the observed redd was misidentified and belonged to one or several early-spawning large brown trout. Conversely, any eDNA signal from a single Chinook spawning pair or female could have been too diluted to be detected at the downstream sampling site (Melchior and Cindy 2023). However, when taken together,

the results from both methods lead to the same conclusion: the salmon spawning run in the Pomahaka catchment this year was likely either non-existent or extremely small.

5.2. Fish Community and Native Species

The eDNA results confirm the widespread and established presence of brown trout and longfin eels throughout the entire surveyed area. The detection of kanakana and the galaxiid complex at multiple sites is also significant, as it confirms these waterways continue to provide habitat for these important native species. Although definitive species-level identification of the galaxiids was not possible at all sites, non-diadromous galaxiids were present the genetic signatures have been retained on file for future comparison as reference databases improve.

5.3. Taxon Independent Community Index (TICI)

The TICI results provide valuable insights into the catchment's overall ecological health. The strong negative correlation between TICI scores and distance from the headwaters suggests that cumulative downstream impacts are a key driver of ecological condition. This trend was consistent along the main stem of the Pomahaka River, with health degrading from almost ‘pristine’ in the upper reaches to 'good' further downstream.

While these data point to cumulative effects from land use, other factors may also contribute to this pattern. Natural changes in habitat, such as increased sedimentation and slower water velocity in the lower catchment, could be partly responsible. The natural decline in the diversity of diadromous (migratory) fish species with increasing distance from the sea (Joy & Death, 2004) is another potential confounding factor that may influence the TICI scores. Despite these confounding factors, the TICI analysis may still provide insight to guide future restoration work.

The tributary sites did not align as closely with the overall spatial trend. The Waipahi River site had a significantly lower TICI score than predicted by the model, likely reflecting more intensive land use within its specific sub-catchment. The Leithen Burn also fell slightly below the trend line, suggesting it is subject to localised pressures. These findings suggest that while distance from the source is a useful general model, the unique characteristics and land use within each sub-catchment play a critical role in determining its ecological health.

6. Conclusions

This study used environmental DNA analysis to survey for Chinook salmon and assess aquatic ecosystem health in the Pomahaka catchment.

The primary finding was an absence of Chinook salmon DNA at all eight sites across the Pomahaka, Waipahi, and Leithen waterways. When considered alongside other recent survey efforts, this result strongly suggests that the 2025 salmon spawning run was either negligible or did not occur.

The Taxon Independent Community Index (TICI) scores indicated that ecological health ranged from 'good' to 'excellent'. However, a clear and significant trend of declining health was observed from the headwaters to the lower catchment. The Waipahi River site was a notable outlier, showing significantly poorer health than predicted by the model, which suggests it is affected by localised pressures. Despite these pressures, the survey confirmed the catchment continues to support important native species, including longfin eels, lamprey, and non-diadromous galaxiids.

These findings can help inform future fisheries management. The lack of a detectable salmon presence provides further evidence of the collapse of the Clutha sea-run salmon fishery. The downstream decline in ecological health, particularly in the Waipahi sub-catchment, points to the ongoing need for targeted management actions to mitigate the cumulative impacts of land use on water quality.

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