



# 2024 Harper Salvage Field Report



**North Canterbury Fish & Game**

This report was prepared by staff at the North Canterbury region of New Zealand Fish & Game, for use in reports to regional council or other internal reports as needed. Cover image: Peter Meecham.

## Introduction

In order to feed Lake Coleridge for Manawa Energy's hydro-electricity generation at the Coleridge Power Station, water from the Harper River is diverted into Lake Coleridge via intake gates located at Harper Village (43°13'1.73"S, 171°27'42.01"E). During closedown periods for maintenance, fish can become stranded in the lowered water levels of the diversion race and delta at the head of the lake. North Canterbury Fish & Game had previously been contracted to salvage the dewatered raceway in November 2010 (Barr, 2010).

Fish species most commonly found in Lake Coleridge and surrounding tributaries include brown trout (*Salmo trutta*), rainbow trout (*Oncorhynchus mykiss*), landlocked chinook salmon (*Oncorhynchus tshawytscha*), common bully (*Gobiomorphus cotidianus*), upland bully (*Gobiomorphus breviceps*), torrentfish (*Cheimarrichthys fosteri*), longfin eel (*Anguilla dieffenbachia*), shortfin eel (*Anguilla australis*), Lamprey (*Geotria australis*), and a variety of *Galaxias* species (Stoffels, 2022). This field report provides detail in relation to the fish salvage carried out during maintenance closedown of the Harper Diversion on 27 May 2024.



Figure 1. Location of the Harper Diversion at the top of Lake Coleridge (red pin).

## Methodology

Manawa Energy shut-off of the intake gates in the hours preceding the salvage, and water levels dropped quickly to salvageable levels. The salvage was separated into two parts; the diversion raceway, and the delta (Figure 2). After site visits to both the raceway at the Harper Campsite, and the delta at the lake access point, it was decided to fish the raceway section first as large fish were observed in the lowered water levels of the diversion raceway. Following the initial site visits, the fish tanker was filled from the top of Lake Coleridge near the Wilberforce Diversion weir.

Due to quickly receding water levels, the diversion raceway was split into two parts and fished by two teams; the lower team began at the top of the delta, fishing upstream towards the Harper Campsite. The upper team began at the Harper Campsite and fished upstream to the intake gates. River works in the Harper River above the intake caused dirty water to flow down the diversion raceway and made electric fishing unviable, therefore a combination of large and small scoop nets were used by staff to salvage visible fish from the raceway. Salvaged fish were placed in buckets and immediately taken up to the fish tanker following on the road along the raceway. On completion of the lower raceway salvage, team members joined to assist with the upper raceway salvage.

On completion of the diversion raceway salvage, one team travelled to Ryton Bay to release the salvaged fish back into Lake Coleridge. Fish were netted from the tanker, identified and measured, and carefully released into the lake.

The remainder of the staff travelled back to the delta to electric fish the remnant pools. By this point the water was beginning to recede into the gravels. Two teams therefore electric fished different pools simultaneously to cover as much ground as possible. Fish were placed into buckets and shuttled to the lake edge for release with a side-by-side vehicle. Due to the time-sensitive nature of the delta salvage, fish were not to be measured, but instead identified by group (salmonid, galaxiid, torrentfish, bully, eel) and approximate counts made.

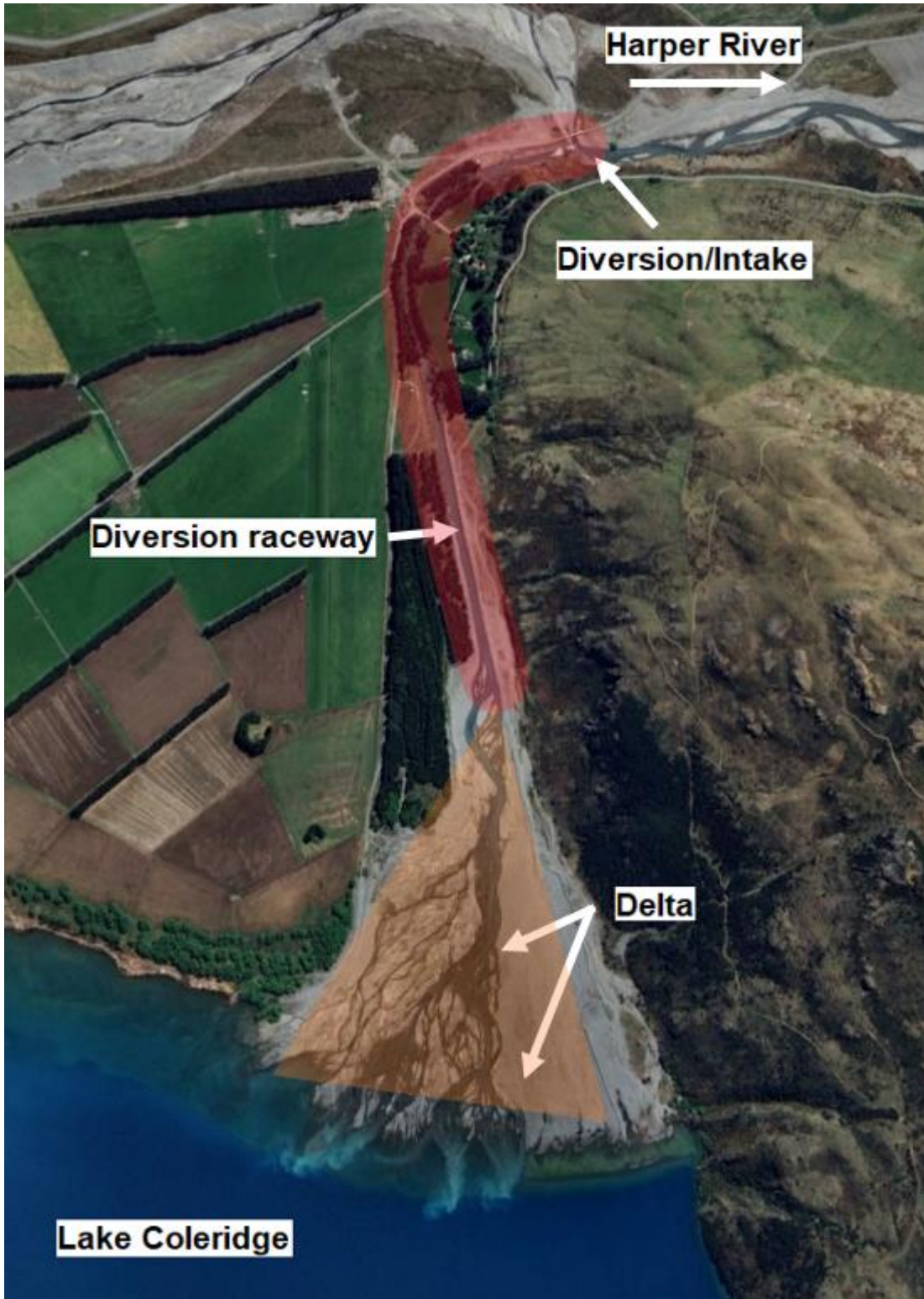


Figure 2. Diagram of the Harper Diversion race showing the section of raceway salvaged (red) and area of delta salvaged (orange).

## Findings

### Diversion raceway

All of the larger trout were salvaged from the diversion raceway, from the bottom section all the way to near the intake gates. Overall, the size ranges for both brown and rainbow trout were similar, but rainbow trout were slightly larger on average (Table 1). A single Longfin eel over 1 metre long was captured approximately halfway up the raceway. A small number of smaller native fish (*Galaxias* sp, Upland bully, and torrentfish) were also salvaged. The galaxiids caught appeared to be made up of Canterbury Galaxias (*Galaxias vulgaris*) and Kōaro (*Galaxias brevipinnis*).

Table 1. Counts, mean lengths and size range of fish species salvaged from the Harper Diversion raceway.

Species	Brown trout	Rainbow trout	<i>Galaxias</i> sp.	Longfin Eel	Upland bully	Torrentfish
Count	4	14	13	1	1	9
Mean length ±SE (mm)	230±123.7	471.1±39.8	66.5±4.8	1100	45	88.7±10.3
Size range (mm)	90-600	85 - 595	42-100	1100	45	35-128



Figure 3. Rainbow trout swimming in the lowered waters of the diversion raceway

### Delta

Salmonids salvaged from the delta were much smaller than those caught in the diversion raceway, ranging from approximately 50mm to 100mm, and the majority appeared to be rainbow trout. Both the torrentfish (Figure 4) and *Galaxias* species also greatly varied in size (~40mm to ~120mm).

Table 2. Species and estimated counts of fish salvaged from the Harper Diversion delta area.

Species	Salmonids	<i>Galaxias</i> sp.	Torrentfish
Est. Count	600+	600+	250+

Compared to the 2010, the number of larger trout in the raceway was much lower (Barr, 2010). The 2010 salvage occurred in November when rainbow trout were on their spawning run and swimming upstream to the spawning tributaries of the Avoca and Harper rivers.



Figure 2. Torrentfish (*Cheimarrichthys fosteri*) being measured before release.

## Recommendations

In the future, when the Harper diversion intake requires maintenance shutdowns, a number of additional steps has been identified that would both increase the collaboration between Manawa Energy and Fish & Game AND enhance fish welfare during salvage operations. A gradual shutdown of the intake over a two-day period would help slow the decline in water levels in the raceway and delta areas, providing more time for effective fish salvage operations to be completed. Additionally, ceasing activities above the intake during these operations is essential to maintain clear, fishable water for electric fishing equipment. Given the variety of native fish species in the delta, involving other agencies, such as the

Department of Conservation (DOC) and local iwi, in future salvage efforts is also advisable. Their input on appropriate relocation sites based on the life histories of these species (e.g., lakes, connected streams, or areas above the intake) would be invaluable. Collaborations like these are vital as agencies work towards shared habitat and ecological goals.

## References

Barr, D. (2010). Harper River/Lake Coleridge Intake Field Report (November 2010). North Canterbury Fish & Game Council.

Stoffels R (2022). New Zealand Freshwater Fish Database (extended). The National Institute of Water and Atmospheric Research (NIWA). <https://nzffdms.niwa.co.nz/download> accessed 29th August 2024.