Breaking barriers – Reconnecting the Albert River

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Key points

- The Albert River in South East Queensland is hydrologically connected following a joint project to remove the redundant Luscombe Weir.
- Luscombe Weir was identified as a priority barrier for removal under the Greater Brisbane Fish Barrier Prioritisation (Rank 3) and the City of Gold Coast Waterway Barrier Prioritisation Assessment (Rank 1).
- This project has reinstated more natural flow conditions and reconnected fish habitats, allowing native species to move freely along the waterway.

Abstract

The Gold Coast is described as the Land of Five Rivers (Dangan Bullen). This includes the Albert River, a major sub-catchment of the Logan River system. In December 2025, the removal of Luscombe Weir marked a significant milestone for river restoration in Queensland, reinstating the Albert River as one of the few hydrologically connected rivers in the state.

CS Environmental, in a consultancy role with the City of Gold Coast (CoGC), has worked closely with catchment planners to undertake a systematic, city-wide assessment and prioritisation of waterway barriers. Luscombe Weir was identified as the highest priority barrier for remediation due to its substantial ecological impact. Positioned low in the catchment, the weir disrupted lifecycle migrations for more than 50% of freshwater fish species (Moore & Potter, 2024) occurring in South East Queensland, contributing to the local extinction of iconic diadromous species, including jungle perch, upstream of the structure.

Despite these impacts, upstream reaches of the Albert River support some of the best conditioned instream and riparian habitats in the region. The catchment also provides habitat for the endangered Mary River cod, a species that relies on unimpeded longitudinal connectivity to locate breeding partners and access critical feeding and spawning habitats essential for long-term population persistence.

This paper outlines the ecological benefits of barrier removal, the collaborative approach undertaken by CoGC and Logan City Council to remediate key barriers and reinstate a free-flowing river system in South East Queensland, and the outcomes of the first post removal fish survey.

Keywords

Albert River, fish passage, barrier removal, Mary River cod

Introduction

The Albert River is a sub catchment of the Logan River and covers approximately 780 km^2, encompassing the townships of Beenleigh, Tambourine and Canungra in South East Queensland. The Luscombe weir was built in the Albert River in 1951 to provide drinking water for Beenleigh. This water supply stopped in the mid-1960s due to water quality problems. Options analysis determined that removal of the structure was the most feasible option both environmentally and economically (SMEC, 2008). Following preliminary investigations, funding was provided from the joint asset owners, City of

Gold Coast (City) and Logan City Council (LCC). Demolition of the structure was completed in December 2025.

Luscombe Weir was a concrete gravity weir (see Figure 1), measuring 4 m in height and 35.6 m in length (BMT WBM, 2018). The weir had a 21.5 m uncontrolled ogee fixed-crest spillway that was positioned 0.95m below the weir crest (GHD, 2001). It was constructed with a North American style overfall pool and a fish ladder, which was no longer operational on the left side (looking downstream) of the spillway (BMT WBM 2018).

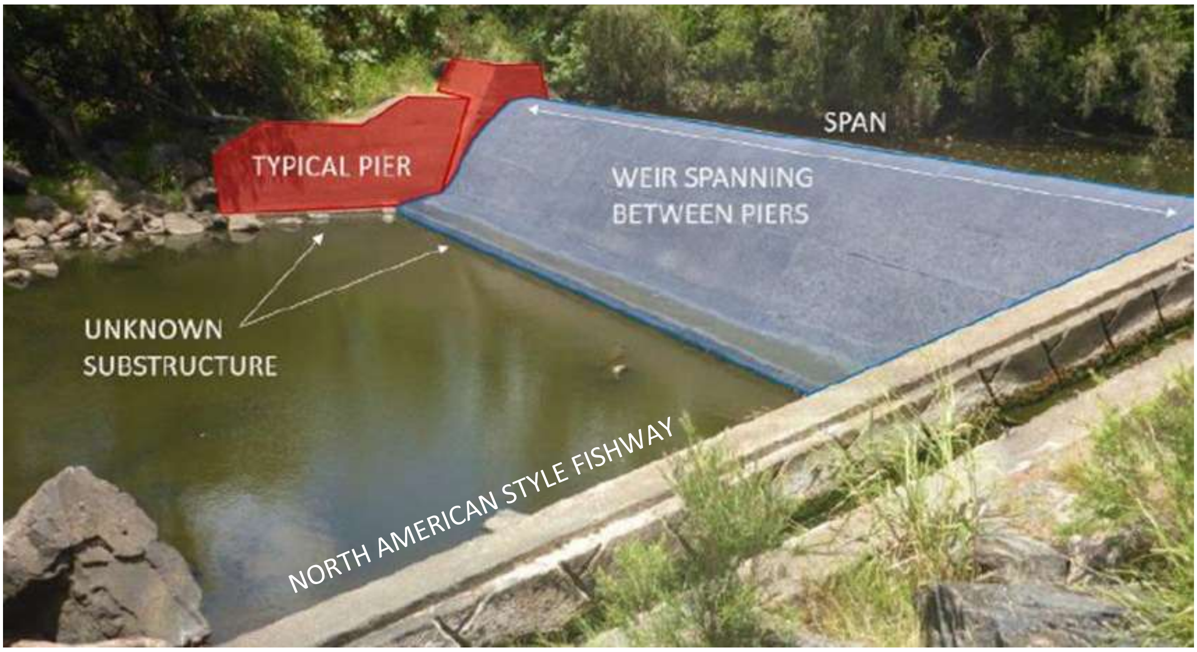

Figure 1 Image of Luscombe Weir showing the weir components, the north American style fishway can be seen in the front of image

Luscombe Weir altered the Albert River system significantly. The changes to river condition have important implications for waterway health including:

- changes in water quality from water retention, restricting natural flow;
- worsening of downstream ecosystem conditions and water quality regimes;
- changes in sediment type and availability within the waterway,
- reduced connectivity between upstream and downstream reaches, inhibiting migration of diadromous fish species (fish that move between fresh and salt waters), and
- changes in downstream flow regimes affecting geomorphology and ecology of flow-dependent ecosystems (Moore & Potter, 2024).

In recognition of these impacts, the City, in partnership with Logan City Council, initiated the removal of Luscombe Weir as a river restoration project aimed at reinstating natural river processes (see Figure 2).

Figure 2 Before and after removal image of Luscombe Weir location, Albert River

Removal of the weir aligns with the City’s “Our Natural City Strategy 2032” and Logan City Council’s “Albert River Vision”, which collectively seek to improve ecological condition, enhance connectivity between freshwater and estuarine reaches, and restore fish passage throughout the catchment (LCC, 2016; CoGC, 2023b). We are currently monitoring these improvements in several ways, one of which is assessing changes in fish diversity and abundance relative to baseline, or pre-weir removal conditions.

Monitoring Approach and Design

Monitoring was conducted to establish baseline fish-community data prior to the weir removal. Previous investigations in the study area informed the development of this monitoring program with the first survey conducted in May 2024, representing post-wet season conditions. The initial assessment involved boat electrofishing and environmental DNA (eDNA) sampling at 10 sites (see Figure 3) across the catchment.

Three sites were located downstream of Luscombe Weir, while seven were located upstream, extending as far as Wonglepong (Canungra Creek) and Kerry (upper Albert River). eDNA analysis reveals the composition and distribution of aquatic species through detection of trace genetic material in water samples. The combination of traditional electrofishing methods with emerging eDNA surveys aimed to maximise species detection and assess the efficacy of eDNA for monitoring freshwater fish communities.

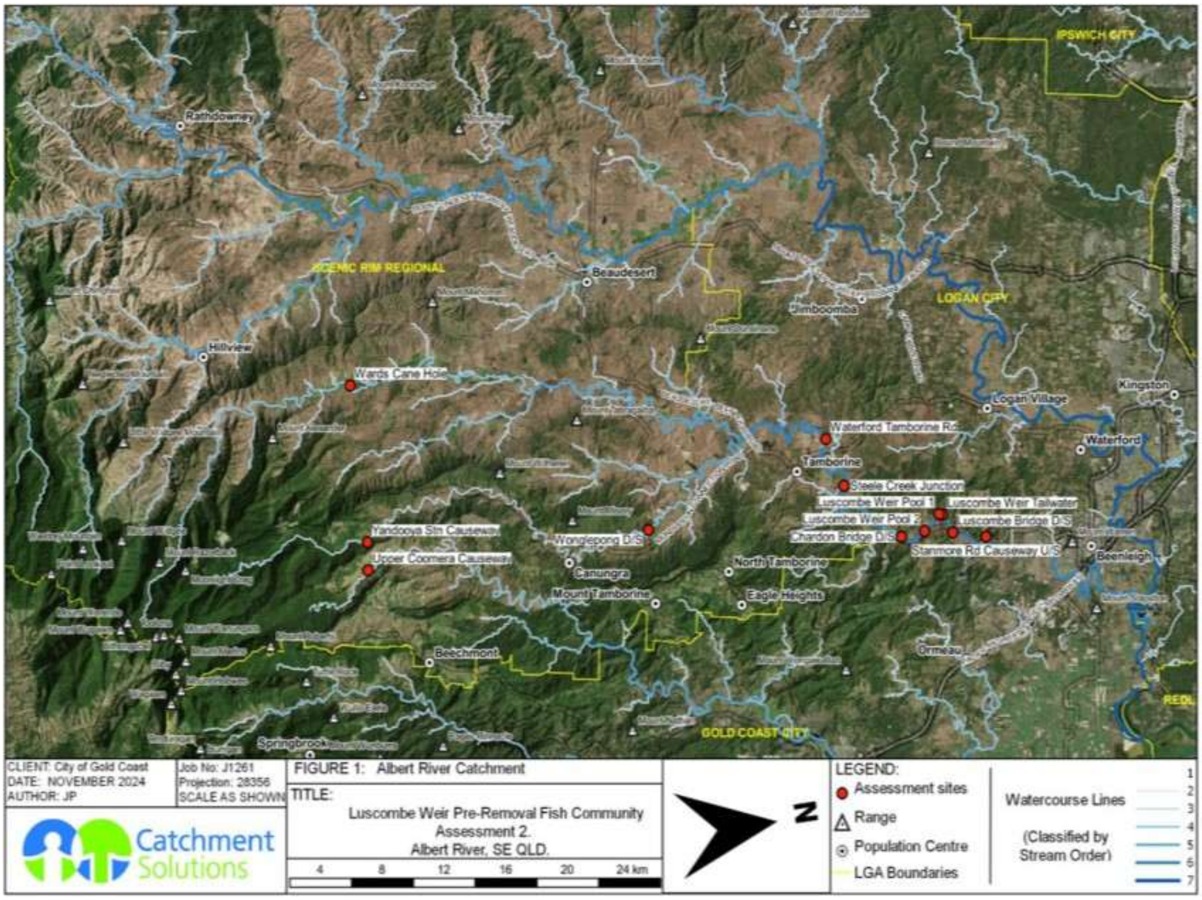

Figure 3 Monitoring site locations for fish community assessments in the Albert River catchment

A second round of fish community sampling took place in October, 2024. This second sampling effort was conducted during pre-wet season (dry) conditions to account for seasonal variations and complete the baseline dataset. The methodology for the second round was generally consistent with the first, except for the following changes:

- A new site was established at Yandooya Station (upper Canungra Creek), adjacent to Lamington National Park, to provide further insight into species distribution across the catchment.
- A refined eDNA sampling method was introduced in the second round to minimise contamination risks and enhance the reliability of results. This included using a Smith-Root CS auto-sampler for pumping and filtering samples, which reduced contamination risks.
- eDNA samples were analysed in the laboratory (EnviroDNA) using three metabarcoding assays: 12S, 16S, and vertebrate, compared to just one (12S) in round 1.

A third round of fish community sampling took place in June, 2026. This third sampling effort representing post-wet season conditions to compare against the pre-demolition conditions. The methodology for the third round was generally consistent with the previous round of sampling, except for a delay in sample collection until June due to non ambient conditions throughout May. Because only six months had passed since barrier removal, the initial fish survey likely captured early-stage responses rather than the full ecological effects, as population recovery, recruitment cycles, and upstream recolonisation typically require longer timeframes to become evident. A further survey is planned for May 2027.

Minor differences in eDNA sampling and laboratory-analysis methods between the three surveys may slightly affect species detection comparability. However, all surveys followed consistent quality-control procedures and targeted similar habitats, so overall catchment-wide patterns remain broadly comparable.

Discussion

Fish migration is an essential life-history adaptation used by many freshwater fish species in coastal catchments in the South East Queensland region. Migration strategies between key habitats have evolved for a variety of reasons, including feeding and reproduction, predator avoidance, nursery-habitat utilisation, maintaining genetic diversity, and population dispersal. Barriers that disrupt longitudinal connectivity reduce species richness, the number of different species present and can lower catch rates, which reflect the number of individuals captured per unit of sampling effort. These impacts reduce fisheries productivity and create environmental conditions favourable for invasive pest fish species.

Significantly, just over half of the City of Gold Coast freshwater fish species undertake ontogenetic shifts in habitat use between estuarine and freshwater environments (Moore & Potter, 2024). Remediating barriers and maintaining connectivity between saltwater and freshwater are therefore critical for supporting healthy freshwater fish communities and improving overall aquatic ecosystem health. The influence of Luscombe Weir on sea mullet populations was evident in the pre-removal fish survey results (Figure 4). Post-removal data (Figure 4) show higher sea mullet catch rates at upstream sites, showing enhanced longitudinal connectivity and successful passage beyond the former barrier.

Prior to removal, while diadromous species were found upstream, their abundance, measured by catch per unit effort (CPUE), was generally lower than downstream. This was especially noticeable in empire gudgeon (H. compressa), with catch rates 98.4% higher downstream (0.62 fish/min) compared to upstream (0.01 fish/min) (Moore & Potter, 2024). Empire gudgeon spawn in lower freshwater and brackish habitats, with eggs transported downstream into marine environments during elevated flows (Pusey et al., 2004). Larvae then migrate upstream into freshwater, but Luscombe Weir likely impeded this movement. This assumption is supported by the post-removal data (Figure 5), which show increased upstream abundance following the barrier removal.

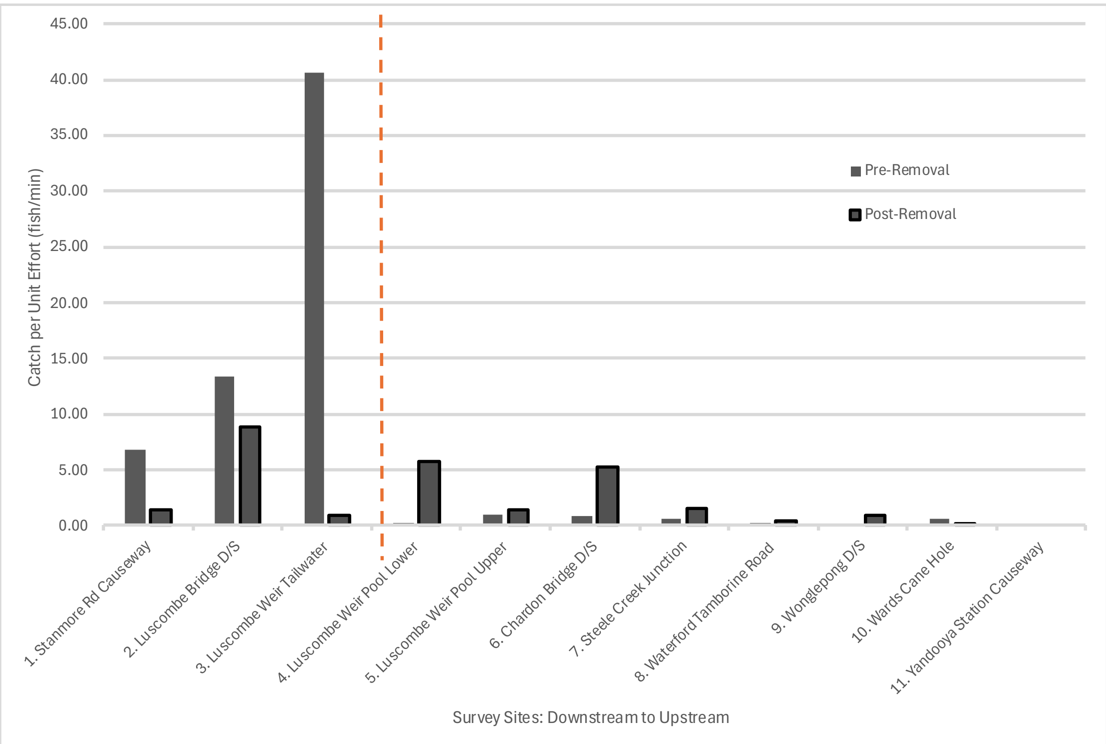

Figure 4 Graph Showing the standardised abundance (CPUE: fish/min) of sea mullet (M. cephalus) at each site from downstream (left) to upstream (right)

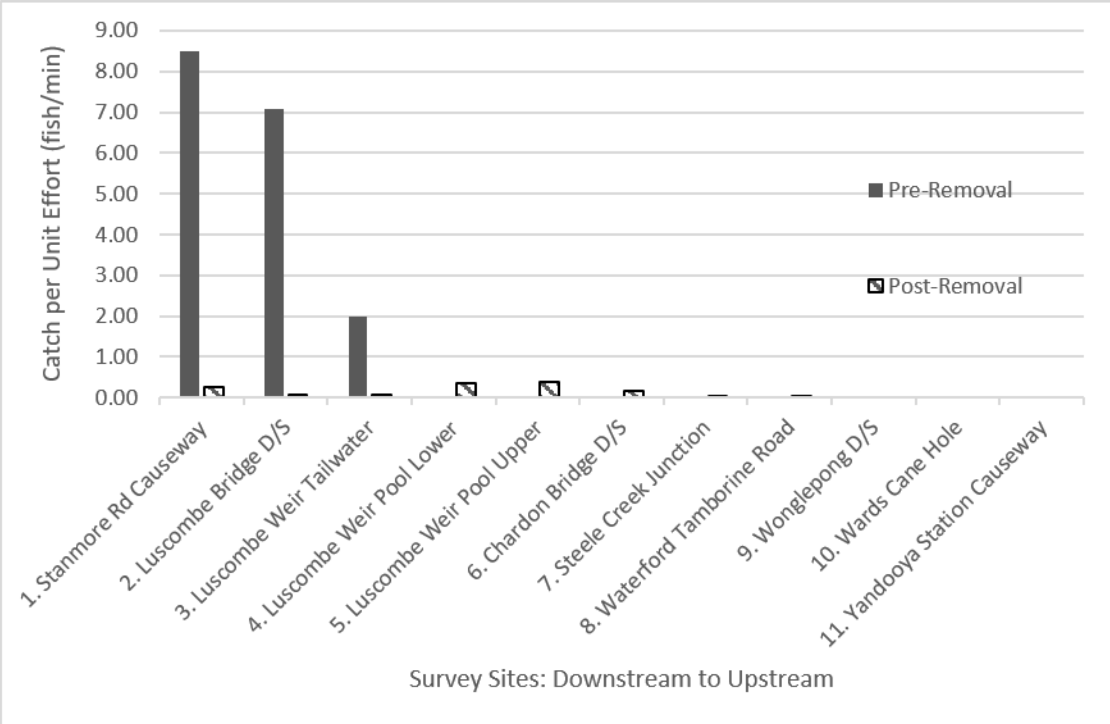

Figure 5 Showing the standardised abundance (fish/min) of empire gudgeon (H. compressa) at each site from downstream (left) to upstream (right)

Occasionally, during major flooding events, the weir may have experienced 'drown-out' conditions, during which upstream and downstream water levels equalised, provided some opportunity for fish passage. However, this limited window for migration would have been available to species and size classes migrating at the time the weir was drown-out, triggered by infrequent flood events. Given the former weir height of 4 m, such flooding events were rare, making it unlikely to align with the migratory needs of the fish species in the Albert River. This interpretation is supported by the finding that both species richness and catch rates of diadromous species were lower upstream of the weir prior to removal of the structure.

Removal of Luscombe Weir (Figure 6a) immediately reinstated hydrological connectivity along the Albert River, enabling native fish to move freely between upstream and downstream habitats. This improvement is reflected in the post-removal survey results, which show increased upstream movement of diadromous species, such as empire gudgeon (Figure 5). These species will now be able to navigate past the obstacle to access freshwater nursery and feeding habitats. In addition, species richness (including smaller-bodied native fish like gudgeons) has increased in upstream reaches.

The Stanmore Road crossing (Figure 6b) is located immediately upstream of the tidal limit and approximately 4.5 km downstream of Luscombe Weir and presents the final barrier to fish migration within the Albert River. The road crossing allows for movement of aquatic biota through eight existing culverts. However, during higher flow events, water velocities through these culverts are thought to be too high for juvenile fish migrating upstream to pass. (Moore & Power, 2022). The crossing is now obsolete and scheduled for removal in 2026.

(a) (b)

Figure 6 (a) Demolition commencing on Luscombe Weir, November 2025; (b) Stanmore Road Causeway, Yalata. The last remaining waterway barrier on the Albert River, Qld. It is scheduled for removal in 2026

Conclusions

The reduction in distribution and abundance of many socioeconomically important diadromous fish species throughout much of their former range can be directly attributed to migration barriers, particularly low passability structures such as Luscombe Weir (Moore & Potter, 2024). Barriers disrupt longitudinal connectivity along waterways reduce aquatic ecosystem health and the ability of waterways to maintain resilience in the face of increasing anthropogenic pressures such as poor water quality and pest fish. Post-barrier-mitigation monitoring indicate a marked shift in species composition and upstream movement of diadromous species, demonstrating early signs of improved connectivity and ecological response to the removal of Luscombe Weir (Moore & Nix, 2026).

Post-removal survey occurred six months after barrier removal, too soon to expect full recolonisation or recruitment responses. However, the shift in species composition (especially increased diadromous proportion) suggests connectivity benefits are already emerging. The fastest response was seen in potamodromous diversity, because reconnecting the river restores the natural movement pathways these species rely on (Moore & Nix, 2026). Potamodromous fish migrate entirely within freshwater, often moving between pools, riffles, tributaries, and upstream nursery habitats.

Once the barrier is removed, these species can rapidly expand into previously inaccessible reaches, increasing both the number of species detected and the distribution of individuals across the catchment. Because potamodromous species often have shorter migration distances and faster life cycles than diadromous species, they are typically among the first groups to show increased diversity following restoration of connectivity (Pusey et al., 2004).

The early post-removal monitoring provides compelling evidence that the restoration of connectivity at Luscombe Weir has set in motion a positive ecological trajectory for the Albert River. Even within the brief six-month window following removal, clear shifts in species composition, most notably the renewed upstream presence of diadromous taxa, signal that long-disrupted migration pathways are beginning to function once again. Potamodromous species responded rapidly, expanding into newly accessible reaches and increasing local diversity as freshwater movement corridors were re-established. These encouraging early outcomes highlight the substantial ecological gains achievable through barrier mitigation, demonstrating how reconnecting fragmented waterways can immediately enhance ecosystem resilience and support the recovery of migratory fish communities. Continued long-term monitoring will be essential to capture the full extent of these benefits, but the initial results already underscore the success of the intervention and its value for the broader health of the Albert River (see Figure 7).

Figure 7 Juvenile freshwater mullet (*Trachystoma petard*) captured upstream of Luscombe Weir removal project site (shown in background). Freshwater mullet are a cornerstone species in the Albert River catchment, playing a vital role in maintaining ecosystem function through their long-distance movements, grazing activity, and contribution to nutrient cycling, while also supporting cultural, recreational, and ecological values across the region. Post removal results show increased abundance upstream from the former barrier (Moore & Nix, 2026)

Acknowledgements

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