Just add salt: Opening the floodgates for coastal wetland restoration

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Key points

- The Yuwi Coastal Wetland Restoration Project addresses ecological decline in Cape Palmerston National Park caused by a 1960s bund – an earthen embankment built to hold back water - that excluded tidal flows and converted a tidal wetland into a freshwater system dominated by invasive Olive Hymenachne.
- Co-designed by Yuwi Traditional Custodians and Greening Australia, the project combined Traditional Knowledge with hydrodynamic modelling, acid sulfate soil assessment, ecological surveys, cultural heritage investigations, and on-Country fieldwork to inform restoration design.
- Restoration planning identified reinstatement of tidal exchange as the most effective intervention, leading to excavation of a seven-metre breach in November 2025 and the return of saltwater on the first high tide in December.
- The project is expected to restore six hectares of mangrove and saltmarsh by 2057 while strengthening Yuwi governance, supporting Indigenous employment, re-establishing blue carbon sequestration, and providing a replicable model for First Nations-led wetland restoration.

Abstract

The Yuwi Coastal Wetland Restoration Project restored tidal connectivity to a degraded coastal wetland at Cape Palmerston on Yuwibara Country, delivering environmental, cultural and community benefits through a Traditional Owner-led partnership. Historic bunding had excluded tidal flows, altered wetland hydrology and enabled widespread invasion by Olive Hymenachne. In response, Yuwi Aboriginal Corporation, Greening Australia, Queensland Parks and Wildlife Service, James Cook University and technical partners co-designed a culturally led restoration approach that combined Traditional Owner knowledge with hydrodynamic modelling, ecological assessment, cultural heritage investigations and on-Country planning. Partial removal of the artificial bund wall reinstated tidal inundation and triggered rapid ecological recovery, including hymenachne dieback across an estimated 4–5 ha, improved fish passage and aquatic connectivity, and natural regeneration of mangroves and estuarine habitat. These changes have restored hydrological function and laid the foundation for long-term blue carbon recovery, biodiversity gains and greater coastal ecosystem resilience. Yuwi leadership was embedded throughout planning and delivery through the Yuwi Project Reference Group and application of Free, Prior and Informed Consent principles, ensuring the project aligned with cultural values and Traditional Owner aspirations. The project also created opportunities for on-Country participation, training, skills development and long-term monitoring, strengthening Yuwi capability in restoration and natural resource management. It provides a replicable model for partnership-based coastal wetland restoration across Reef catchments and more broadly on restoration projects.

Keywords

coastal wetland restoration, tidal reconnection, blue carbon, Traditional Owner-led restoration, Yuwibara Country, mangrove regeneration, invasive species management, Reef catchment

Introduction

Coastal wetlands are among the most productive ecosystems in the Great Barrier Reef catchment, providing habitat, improving water quality, supporting fisheries and storing large amounts of carbon in vegetation and sediments (Waterhouse *et al* 2024). Across eastern Australia, many of these systems have been degraded by bunding, drainage and land-use change that disrupt natural tidal exchange and alter ecological function (Abbott *et al.* 2020; Glamore *et al.* 2021). Restoring tidal connectivity is increasingly recognised as an effective nature-based solution because it can recover wetland processes while also delivering biodiversity, cultural and blue carbon benefits (Hagger *et al.* 2022; Hagger *et al.* 2024).

The Yuwi Coastal Wetland Restoration Project focuses on a degraded wetland at Cape Palmerston on Yuwibara Country, where an artificial bund constructed in the 1960s excluded tidal flows and transformed a tidal wetland into a freshwater system dominated by invasive Olive Hymenachne (Figure 1). For Yuwi Traditional Custodians and project partners, restoration presented an opportunity to heal Country by reinstating natural hydrology, improving ecosystem condition and re-establishing the processes that support mangrove and saltmarsh recovery. While the project explored this blue carbon potential, the current restoration was ultimately considered unviable for formal carbon registration given the relatively small scale of its impact; the value here lies instead in demonstrating the method and informing larger future projects.

This paper outlines the co-designed approach used to plan and implement restoration, combining Yuwi leadership and Traditional Knowledge with hydrodynamic modelling, ecological surveys, Acid Sulfate Soil(ASS) investigations, cultural heritage assessment and on-Country fieldwork. It describes how reinstating tidal exchange was identified as the preferred intervention, summarises the early ecological response following bund breaching, and discusses the broader implications for Traditional Owner-led coastal wetland restoration in the Reef catchment. In doing so, the paper highlights the value of culturally led, partnership-based restoration for delivering integrated environmental, cultural and community outcomes.

Figure 1 Historical Imagery of the Cape Palmerston Wetland - including installation of the bund before 1970. White solid line in 1970 and 2021 images show the location of the installed bund

Cape Palmerston Coastal Wetland Restoration Project

Project location and background

The Cape Palmerston Coastal Wetland Restoration Project is located within Cape Palmerston National Park, 50km south of Mackay on the central Queensland coast (Figure 2(a)). The National Park spans more than 7,000 hectares and contains diverse coastal ecosystems including beaches, dunes, mangroves, freshwater wetlands, and eucalypt woodlands. The project focuses on a 50-hectare wetland system (Figure 2(b)) that was historically tidal but became artificially impounded following

construction of a bund in the 1960s, which excluded tidal exchange and altered the site's natural hydrology (Figure 2).

The area is culturally significant to the Yuwibara people, who have maintained a strong connection to the land and waterways for thousands of years. Following European settlement, the area was used for grazing, fishing, and oyster harvesting before being gazetted as National Park in 1976.

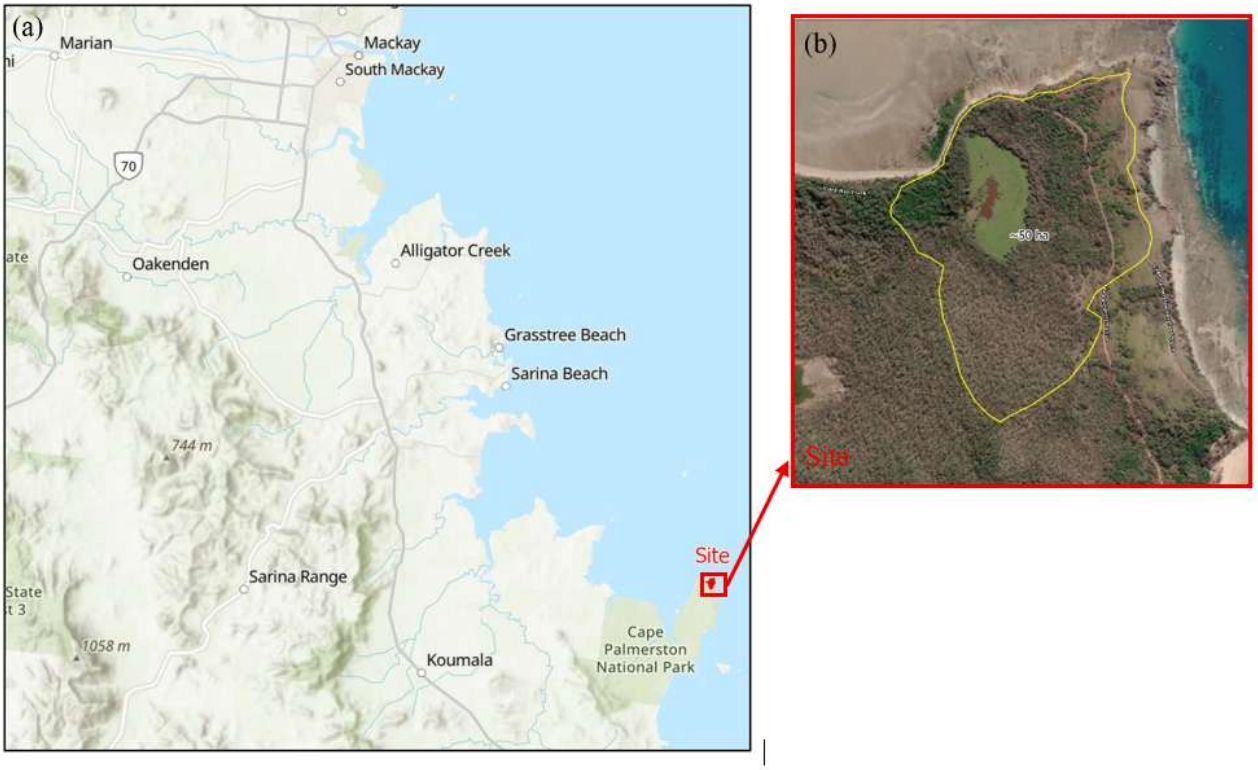

Figure 2 Site location (a) and approximate project area comprising wetland catchment and outlet channel (b)

Values

The site holds significant cultural, environmental, and social values. Cultural surveys and Traditional Owner knowledge identify shell middens, story places, trade-route indicators, and culturally important landscapes throughout the area. The wetland and surrounding coastal environments continue to support Yuwibara cultural practices, knowledge sharing, and aspirations for cultural reconnection and on-country management.

Environmentally, the site supports a range of regionally significant ecosystems including melaleuca woodlands, mangroves, grasslands, and wetland habitats. The broader Cape Palmerston area provides habitat for marine turtles, migratory shorebirds, dugongs, and whales, with surveys confirming internationally significant numbers of eastern curlews. The wetland also connects to marine environments within Ince Bay, an area of high ecological significance.

Socially, the National Park is a valued recreational destination for camping, fishing, birdwatching, and nature-based tourism, with opportunities to improve visitor education around cultural heritage and wetland restoration

Condition

While much of the surrounding National Park remains in good ecological condition, the wetland itself is highly degraded due to altered hydrology and invasive species. Loss of tidal exchange has resulted in stagnant water, poor water quality, reduced habitat diversity, and extensive infestation by hymenachne (*Hymenachne amplexicaulis*), which dominates the wetland.

The site is also affected by pest animals including pigs and foxes, weed infestations, litter, and localized visitor impacts. Native wetland habitat values have been substantially reduced, with limited open water, poor faunal diversity, and evidence of significant ecological decline. Previous herbicide management of hymenachne was costly and ineffective as a long-term solution.

Opportunities

The project presents significant opportunities for ecological restoration, cultural healing, and potential co-management opportunities between the Yuwi People and Queensland Parks and Wildlife. Reinstating tidal exchange through removal or modification of the bund would restore natural hydrology, improve water quality, suppress hymenachne naturally, and re-establish tidal wetland habitat for fish and bird species. Figure 3a shows the proposed works area in relation to tidally connected land, and 3b shows the bund itself, which is approximately 55m long.

Additional opportunities include coordinated weed and pest animal control, improved visitor management, enhanced biodiversity outcomes, and stronger cultural engagement through Traditional Owner-led management and interpretation. The project also provides opportunities for cultural education, community engagement, eco-tourism, and long-term economic and employment pathways for the Yuwibara community through restoration and ongoing land management activities.

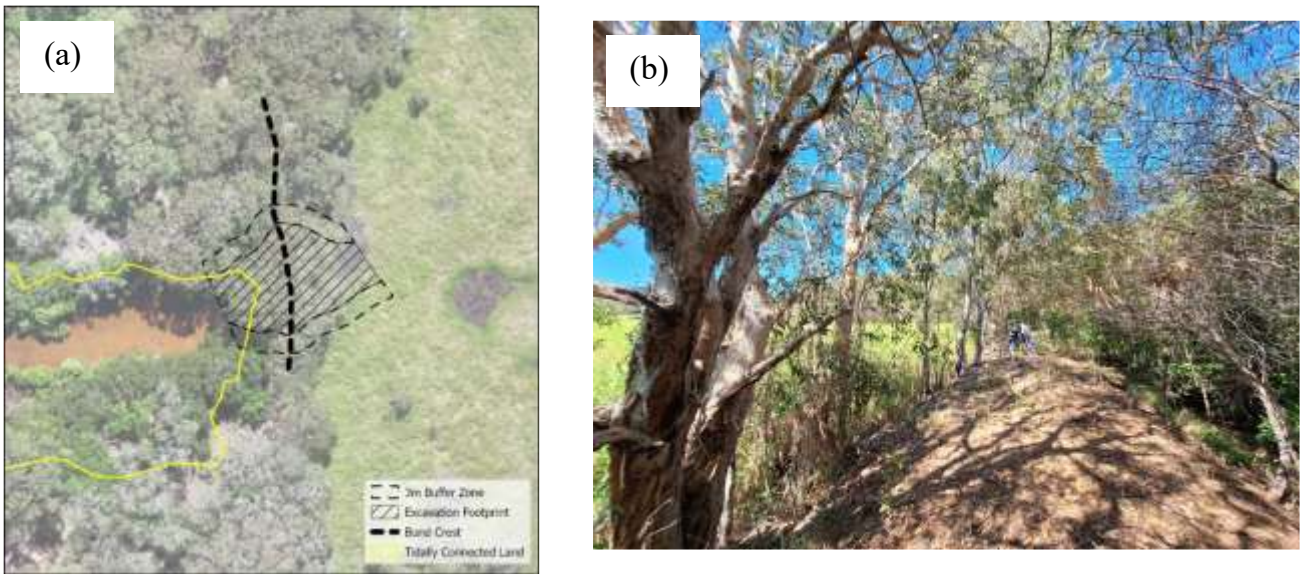

Figure 3(a) Proposed works in relation to tidally connected land and (b) visual image of the installed bund

Methodology

The Cape Palmerston Coastal Wetland Restoration Project was developed through a co-design partnership between Greening Australia (GA), the Yuwibara Aboriginal Corporation (YAC), and the Queensland Parks and Wildlife Service (QPWS), and funded by the Australian Government's Reef Trust. The project aimed to restore natural tidal exchange to a historically bunded wetland system as part of a broader "healing Country" initiative across Cape Palmerston National Park.

The project scope included feasibility assessment, hydrodynamic modelling, detailed design, approvals, construction, and post-construction monitoring. Investigations focused on the wetland, its contributing catchment, and the receiving tidal channel affected by the historic bund.

Feasibility assessment

Field investigations were undertaken in partnership with James Cook University and included drone photogrammetry, Real-Time Kinematic positioning (RTK) survey, wetland bathymetry, and tidal and hydrological monitoring. These datasets were calibrated to Australian Height Datum and used to

develop a digital elevation model (DEM) of the site. Water level, salinity, and temperature loggers were installed upstream and downstream of the bund and at the tidal outlet. Historic tidal records from Mackay were used to characterise tidal behaviour (Waltham *et al.* 2025).

Acid Sulphate Soil (ASS) investigations were undertaken at 16 locations across the project area. Results indicated naturally acidic soils but no acid sulphate material requiring treatment.

Hydrodynamic modelling

A 2D HEC-RAS hydrodynamic model was used to assess restoration feasibility and expected tidal inundation, simulating tidal exchange under existing and proposed bund-opening scenarios. A tidal frequency analysis further informed the design but is not reported in detail here

The hydrodynamic model tested three configurations — the existing bund, a 5 m opening, and a 7 m opening (both openings with 2:1 (H:V) side slopes) — under two tidal forcing conditions: the Highest Astronomical Tide (HAT), and HAT with a uniform sea-level/climate offset applied to the ocean boundary (HAT + CC). This produced six scenarios in total:

1. Existing @ HAT
2. Existing @ HAT + CC
3. 5 m opening @ HAT
4. 5 m opening @ HAT + CC
5. 7 m opening @ HAT
6. 7 m opening @ HAT + CC

For each scenario, the model generated outputs at 5-minute intervals capturing water surface level, depth, flow velocity, and shear stress at the opening. From these, we mapped the maximum water surface elevation (max WL) reached during the simulation and the associated inundation extent, giving a detailed picture of the wetland's response to tidal inflow — areas of inundation, changes in water depth, and flow and erosion behaviour over time (Peak water levels and inundation areas are summarised below for all scenarios (Table 1; Figure 4).

The modelling demonstrated that the existing bund prevented tidal inundation, with tidal water reaching only the outer edge of the bund without entering the wetland. By contrast, either opening would allow periodic tidal exchange across approximately 5-6 ha of wetland habitat, improving salinity, water movement, and wetland connectivity (Waltham et al. 2025). Comparing water level, velocity and shear stress across the options allowed assessment of flow behaviour, erosion risk and likely sediment movement, which guided the final design and identified whether bed or bank stabilisation would be needed to support a stable, long-term reconnection.

Table 1 Peak water levels and inundation areas are summarised below for all scenarios

Scenario	Boundary tide	Peak water level (WL) (m AHD)	Inundation areas (m^2)
Existing	HAT	3.66	7,773
Existing	HAT + CC	3.98	11,644
5m opening	HAT	3.66 - 3.30	45,278
5m opening	HAT + CC	3.98 - 3.68	79,137
7m opening	HAT	3.66 - 3.30	45,985
7m opening	HAT + CC	3.98 - 3.69	79,795

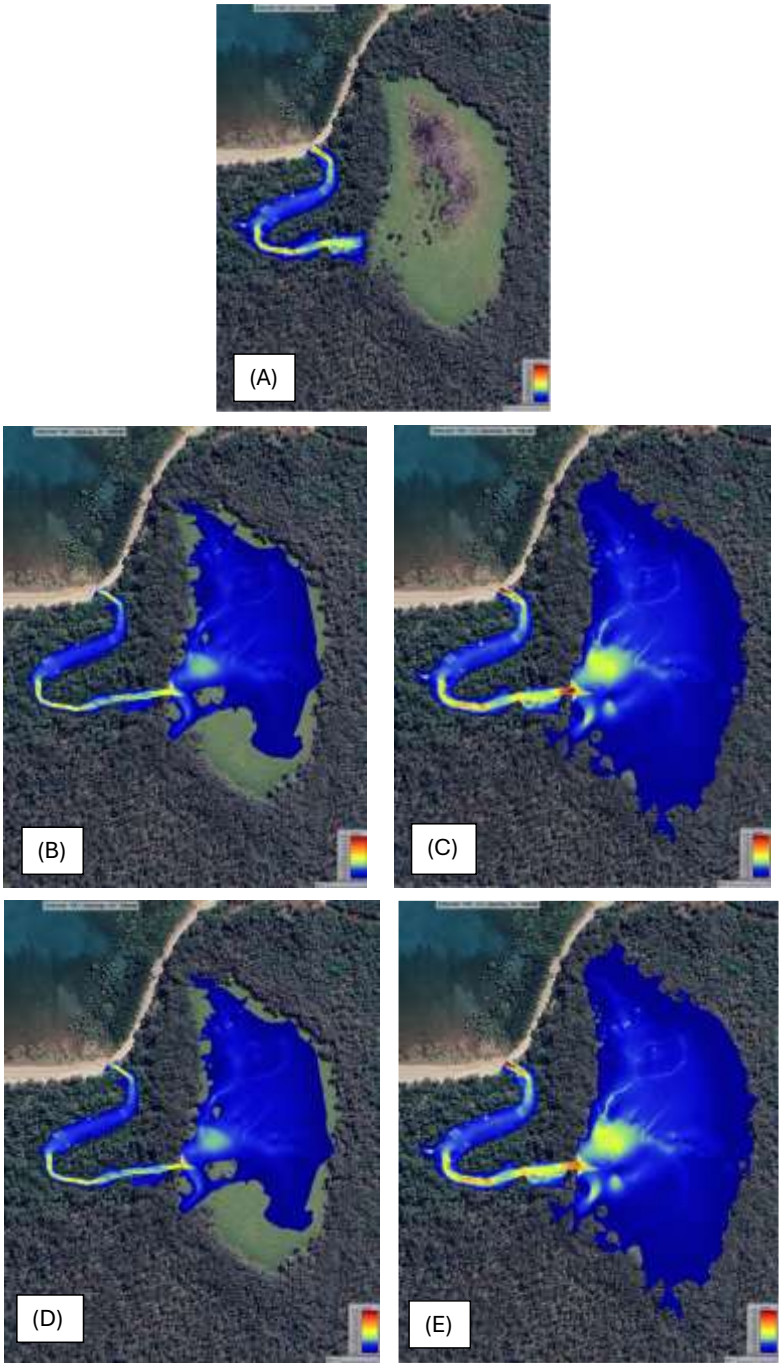

Figure 4 Depth Averaged Velocity (M S^{-1}) for the different bund opening scenarios (A) Under existing conditions (B) 5m opening scenario at HAT (C) 5m opening scenario at HAT + CC (D) 7m opening scenario at HAT (E) 7m opening scenario at HAT + CC

Design considerations and requirements

Detailed design was undertaken by Civil IQ through an iterative co-design process with YAC and QPWS. The final design incorporated a controlled excavation at the historic outlet location to maximise tidal connectivity while minimising environmental disturbance, erosion risk, and impacts to culturally significant features and vegetation. Complementary actions including weed management, pest control, revegetation, and access management were also incorporated into the restoration approach.

The design considerations included:

1. Model details and outcomes – the design must represent the landform changes used to model the future scenario and thus ensure the modelling is realistic
2. Environmental impacts – the design must consider the immediate and ongoing environmental impacts of the work, including ASS, coastal processes, erosion, and habitat
3. Cultural heritage and process – the design must consider and/or comply with requests or directives from Yuwi regarding finished form, processes, timing, and anything else discussed or raised during the co-design process
4. Cost and disturbance minimisation – the design must explore options to minimise the cost of construction and maintenance, as well as the area or significance of the disturbance of the work
5. Timing – the design must consider the timing of the works to ensure access and processes are suitable for the proposed/likely timing of construction

Approvals

Pre-lodgement advice was sought from the State Approvals and Referrals Agency (SARA) and it was agreed that the works comprised restoration work and maintenance to an existing legal structure, so no DA or subsequent approvals would be required. Instead, the works could proceed under existing approved development requirements (ADR) and a permit from QPWS.

Earthworks

Earthworks were completed by Koumala Excavation with some adjustment to the design due to site constraints. Namely, the opening was narrowed from 7m to 5m to avoid removal of a significant eucalyptus tree, and the grade was lowered from 0.45% to 0%. One bank required surface treatment and vegetation due to the soil characteristics, so jute mate was laid and planting this was undertaken shortly after by YAC, QPWS and Sarina Landcare.

Implementation and monitoring

Earthworks were completed in 2025, including excavation of the bund opening and stabilisation of disturbed areas using jute matting and revegetation. Minor modifications to the design were made during construction to avoid impacts to significant vegetation and respond to site conditions. Revegetation activities were undertaken collaboratively by YAC, QPWS, and Sarina Landcare.

Post-construction monitoring is continuing through 2026 and includes assessment of tidal exchange, vegetation response, water quality, and ecological recovery to evaluate restoration outcomes and inform adaptive management.

Results

The project successfully restored tidal connectivity to a degraded coastal wetland at Cape Palmerston on Yuwibara Country through partial removal of an artificial bund wall. Reinstatement of natural tidal flows resulted in rapid ecological change across the wetland system, including widespread dieback of invasive hymenachne over an estimated 4–5 ha and restoration of natural hydrological processes. Early monitoring and site observations identified improved fish passage and aquatic connectivity, increased fish activity, and rapid natural regeneration of mangroves and estuarine habitat within the restored area. Approximately 80% of the hymenachne infestation showed dieback following tidal reconnection, demonstrating the effectiveness of restoring natural tidal processes as a weed management and ecosystem recovery approach.

The project established the foundations for long-term blue carbon and coastal ecosystem recovery. Early outcomes indicate improved wetland habitat condition, increased ecosystem resilience and enhanced potential for ongoing mangrove recruitment and biodiversity recovery over time.

Significant cultural and community outcomes were also achieved through the project's Traditional Owner-led approach. Yuwi leadership and decision-making were embedded throughout project

planning and delivery via the Yuwi Project Reference Group and the application of Free, Prior and Informed Consent principles. The project created meaningful opportunities for Yuwi people to reconnect with Country through participation in ecological surveys, cultural heritage assessments, restoration activities, monitoring, workshops and governance processes.

The project also contributed to capability development within the Yuwi Ranger team and broader community through training and participation in water quality monitoring, vegetation monitoring, bird surveys, crocodile awareness, 4WD operation and blue carbon restoration methodologies.

Strong partnership outcomes were achieved through collaboration between Yuwi Aboriginal Corporation, Greening Australia, Queensland Parks and Wildlife Service, James Cook University and technical delivery partners. These partnerships supported integration of cultural and scientific knowledge systems, collaborative restoration planning and improved understanding of hydrodynamic modelling, monitoring requirements and restoration approvals pathways.

Additional site investigations and prioritisation processes undertaken during the project identified a broader pipeline of future blue carbon and coastal restoration opportunities across Yuwibara Country, establishing a platform for future investment and restoration activities.

Conclusions

The project demonstrates the effectiveness of culturally led, partnership-based coastal wetland restoration in delivering integrated environmental, cultural and community outcomes. Restoration of tidal connectivity produced rapid ecological benefits, including significant hymenachne dieback, improved aquatic connectivity and natural regeneration of mangrove and estuarine habitat. Early outcomes indicate strong potential for long-term recovery of coastal ecosystem function, biodiversity and blue carbon values through reinstatement of natural tidal processes.

Importantly, the project strengthened Traditional Owner participation and leadership in on-Country management while building local capability and fostering meaningful partnerships between Traditional Owners, government, research institutions and environmental organisations. The knowledge, methodologies and collaborative frameworks developed through the project provide a strong foundation for scaling future coastal restoration initiatives across Yuwibara Country and the broader Reef catchment.

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