Progress Report

Muri Environment Care's Riparian Restoration and Research in Rarotonga

Funded through The 3Ps Cook Islands Pilot Project: *Financing Nature as a Solution for Flood Mitigation and Water Quality* and Stanford University's Natural Capital Project

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The 3Ps Cook Islands Pilot Project: *Financing Nature as a Solution for Flood Mitigation and Water Quality* is a Stanford Natural Capital Project initiative delivered in conjunction with the Asian Development Bank (ADB), the Cook Islands National Environment Service (NES), and the Ministry of Finance and Economic Management, and funded by the Moore Foundation. This pilot works with several ADB departments to integrate natural capital assessments and ecosystem service valuation into ADB's loan process for urban and water projects. It also co designs training to build local capacity, both for government officials and community outreach, on how to measure, account for, and apply natural capital approaches in the Cook Islands. As a test case, the project is piloting these methods through the Muri Lagoon wastewater infrastructure project.

As a leader in hands on experimentation and capacity building around locally specific nature based solutions, Muri Environment Care (MEC) was a fitting partner for this project, which supported our riparian restoration efforts in Muri, the same area serving as the focal point for the broader natural capital assessment. Without this funding, the last 11 months of stream restoration would have gone unfunded, leaving critical activities such as seed collection, new species acquisition, nursery propagation research, general nursery operations, and most importantly our stream planting and maintenance program unsupported. Instead, it has allowed us to maintain and upgrade current restoration planting areas and extend our efforts to an additional 50 meters of Parengaru Stream, as well as a much needed 40 meter restoration area along Ngatoe Stream.

Our momentum in riparian restoration planting and native plant research has been continuously building, evolving, and improving. New opportunities have emerged to refine our pilots and adapt them to broader local water projects, earning recognition from multiple partners and raising overall awareness—and we hope, the mana—of our streams. This year we have also reached a stride in attracting new volunteers, with the vast majority of community engagement stemming from our nursery operations and stream planting efforts. We remain active every Wednesday at the nursery and every Thursday at the stream, a tradition that will mark its fourth year this November. Massive thanks to all of the partners who have helped keep these efforts moving. Looking ahead, the next phase is our most ambitious restoration pilot yet: a Tiny Forest planting that encompasses Parengaru Stream in partnership with NES.

This report summarizes progress made possible through this support, from nursery breakthroughs to on-the-ground stream restoration.

Seed collection and native plant work capacity building

Developing the skills and systems for effective seed collection has been a cornerstone of strengthening our nursery operations. Fieldwork and training have improved staff ability to identify, collect, and process native plant material, while long-term monitoring has added critical knowledge about fruiting and flowering cycles. These efforts ensure a steady, diverse flow of seeds into the nursery, which directly underpins the success of our planting projects by providing locally adapted stock.

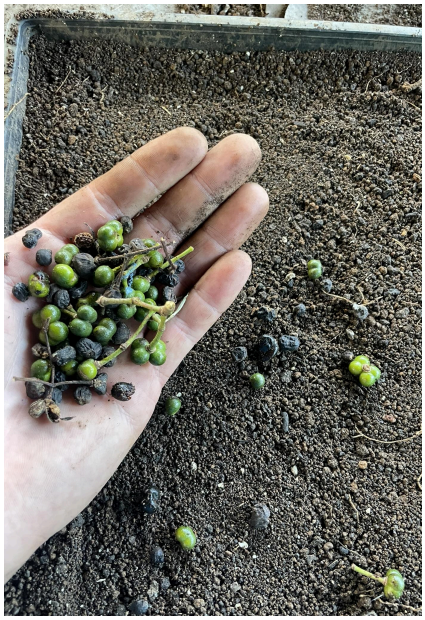
Cook Islands Taxonomic Botanist Anthony Wright (pictured) and local legend Gerald McCormack have been instrumental in native plants as well as educating our field staff on seed collecting missions like one accomplished here on Te Kou 19 December 2024. Field trips that include seed collection and locating new species has been essential in the development of the nursery being the only place attempting to grow the majority of Rarotonga's native plants.

Finding and monitoring key native plant individuals in their natural contexts has also been key to building characteristics profiles for each species we grow in the nursery to know where in the riparian context that they fit in.

Propagation techniques and breakthroughs

Experimentation with propagation methods has steadily expanded the nursery's capacity to produce a wider range of native species. Successes show that persistence and adaptation can unlock new species for large-scale planting, while challenges highlight areas for future research. Each improvement strengthens the nursery's role as a hub of local plant knowledge and increases the resilience and diversity of restoration plantings. In preparation for the 3 May planting day with Te Ara o Te Akau, Rachel Selwyn and Henry MacKenzie made major efforts to propagate *Cyperus javanicus* and Orongā (*Pipturus argenteus*). Until now, we had no success with seeds or cuttings of Orongā, even though we consider it one of the most valuable streamside native plants. The nursery's ability to produce more species each month directly translates into greater diversity and resilience in stream restoration. While these may seem like small steps, each trial expands the toolkit available to restoration practitioners.

LEFT: Mauku Tatau-tai (*Cyperus javanicus*) has thrived in the nursery, and observations from our living collection suggest it is well suited for ephemeral streams such as Parengaru, where it tolerates both flooding and drought while forming a dense mat of fine roots for streambank stability. A recent visitor from Penrhyn also noted its value as a medicinal plant. **RIGHT:** Rooted cuttings have proven to be the key to successfully propagating Orongā (*Pipturus argenteus*), following many unsuccessful attempts with seed and cuttings. This breakthrough, achieved on 27 February 2025, represents an important step in making this species more widely available for restoration.




LEFT: First propagation attempt with the locally rare Au'ere (*Grewia crenata*), 23 June 2025. As of late August, we now have our first 5 seedlings germinated from this locally rare plant.
RIGHT: Monitoring Matimati (*Streblus anthropophagorum*) for flowering and fruiting, with the hopes that it might be a useful addition to the nursery collection, 18 November 2024.


Rarotonga Psychotria (*Psychotria viridifolia)* foliage from a newly discovered location as well as a successful location of fruits. This plant is IUCN red listed as critically endangered. Just last week (9 September) our first ever successful *Psychotria* germination occurred at the nursery, a hopeful sign that we might be able to assist in boosting their numbers through both in-situ protection of existing individuals as well as ex-situ propagation and cultivation.

When continuously monitoring the species that we don't know their exact fruiting and flowering times, we have been adding to our Fruiting and Flowering Calendar as well as our known locations of natives suitable for seed collection to build capacity locally within the native plant research and propagation.


LEFT: Processing Rauriki (*Xylosma suaveolens*) and Kavakava-Ātua (*Piper latifolium*) seeds in preparation for sowing. 27/11/2024. The *Piper* seeds were all unsuccessful but the *Xylosmas* worked beautifully and we now have over 100 in bags. **RIGHT:** A whole morning spent experimenting with different scarification and other methods processing the locally rare Toi tree (*Alphitonia zizyphoides*) which we have now failed to germinate a single seed in 3 consecutive fruit seasons! 9/7/2025

Rare and endangered species research

Work with rare and endangered native plants adds both urgency and depth to nursery operations. Trials and monitoring contribute knowledge that can guide conservation efforts while also broadening the species available for restoration. Even partial successes with these plants build local expertise, while failures point the way toward new techniques. This focus ensures that the nursery is not only producing plants for restoration projects but also contributing to the long-term survival of culturally and ecologically important species.
In the process of our seed collection and botanical efforts we have also identified a number of locally rare and even critically endangered plant species during this reporting period. Methods to control invasives and protect remaining individuals have been trialled as well.

Continued general nursery production and care

Keeping the nursery producing plants consistently has been central to sustaining our restoration work and preparing for bigger future planting projects, but it has also become much more than a production site. The space has grown into a fun and empowering place for volunteers to contribute and connect, often with music playing and conversations flowing while seedlings are tended. This rhythm of shared work not only supplies the plants that protect and

reintroduce biodiversity into our streams, but also strengthens the sense of community around them, making every planting project a collective achievement.

Freshly repotted Puas (Fagraea berteroana) and “Silky Jackbeans” (Canavalia sericea) 5/9/2025

Continued maintenance on previous plantings

While mowing, trimming, and clearing are often seen as the least glamorous parts of restoration, they are absolutely essential to the survival and presentation of planting sites. Without this ongoing work, young native plants would quickly be overtaken by invasive vines and grasses, undermining the investment made in propagation and planting. The purchase of a petrol-powered Stihl hedge trimmer through this fund transformed our ability to meet these demands, reducing tasks that once required a full team and an entire day to only a few hours by a single operator. This renewed our belief in planting vetiver grass as a key feature in early-stage restoration, where keeping it trimmed and separated helps control shallow-rooting vines that threaten the survival of all of the young plants.

Without regular maintenance, even major community events like the very successful Ngatoe planting could quickly lose their impact.


LEFT: Each lateral branch of this Tamanu (*Calophyllum inophyllum*) is now larger than the original tree planted only a year and a half ago. Ongoing care at the site has made it possible to witness the impressive growth and resilience of native species in a riparian restoration context. **RIGHT**: Volunteers from the planting and maintenance team gathered on the famous Parengaru bridge during the morning working bee, 10 July 2025.

Ngatoe Planting

In May 2025, over 30 community volunteers joined MEC and Te Ara o te Akau Inc. (TAOTA) to plant more than 400 native and erosion-control plants along a 40-meter stretch of severely eroded streambank at Ngatoe. The strong turnout demonstrated local ownership and enthusiasm for restoration, showing that large-scale planting days are both achievable and highly motivating.

Ngatoe Stream had been identified through scientific monitoring as a priority site, with erosion and nutrient runoff contributing to downstream coral reef decline and threatening the success of coral nurseries near the stream mouth. Because this site lies close to the end of the stream, interventions here have an immediate and measurable impact on lagoon water quality. Restoring this section of streambank therefore represented a critical intervention to improve lagoon and reef health. Addressing the problem at its source also reduces the need for repeated downstream interventions, making restoration more cost effective and sustainable in the long term.

The planting strategy combined immediate soil stabilization with longer-term ecological recovery. Vetiver and sedge grasses were established along the lower bank to hold collapsing soil, while locally significant trees and other native species were planted across the mid-bank to anchor soil and provide canopy cover. A second line of vetiver was added for reinforcement, and hemp and wool weed matting was applied to suppress weeds, retain soil moisture, and reduce maintenance. All plants were supplied by MEC's conservation nursery, reinforcing its role as a

vital asset for catchment-scale restoration. The plants used at Ngatoe came directly from the expanded nursery collection, highlighting the connection between research, propagation, and on-the-ground restoration.

Most of the group attending the 3 May Ngatoe Stream planting day, a collaboration between Te Ara o te Akau and Muri Environment Care. It was a clear, sunny day, and the motivated team completed the entire 40-meter section much faster than expected.

Henry Mackenzie at Ngatoe Stream, which he identified as a priority site requiring restoration. The photo shows the lack of riparian vegetation on the eastern bank, where volunteers from MEC and Te Ara o te Akau later planted a 40 meter section.

Despite hard ground conditions, the entire planting was completed in just two and a half hours, showing what can be achieved with careful planning and strong participation. The day itself was empowering and fun, building momentum for future initiatives such as the upcoming Tiny Forest (Vaorakau iti) planting.

The event represented only the visible outcome of a much larger effort. In the weeks leading up, a core team invested significant time in surveying the site, designing the layout, preparing plants and materials, coordinating logistics, and engaging the community. This preparation was extensive, but the results demonstrated that the effort was well worth it. Ongoing maintenance is still required at this site, and securing additional funding will be essential to continue this work for at least another year, until the system is more fully established and self-sustaining.

Beyond the ecological gains, the Ngatoe planting has the potential to be a symbol of the community's will to address the root causes of lagoon and reef decline. By working together at the stream itself, volunteers, NGOs, commercial entities, community groups, traditional leaders, and government agencies all demonstrated respect for freshwater systems and recognition that healthy reefs are connected to healthy streams. The site can stand as both a commitment to caring for waterways as living entities and an example of how diverse groups with different roles all share the same goal: clean water and a thriving coral lagoon ecosystem.

Roughly the same section shown above with Henry is pictured here, this time with volunteers planting a mix of native trees, vetiver, and Mauku tatau-tai (*Cyperus javanicus*) closer to the stream flow. 3 May 2025.

A closer look at the detail of the planting design. 3/5/2025.

The planting area in relation to a broader view of the lower Ngatoe Stream. (3 May 2025, just after planting).

Parengaru planting and maintenance

At Parengaru Stream, one of the key strengths of our incremental planting approach is that it avoids large failures by emphasizing steady progress and adaptive management. This method allows us to respond flexibly to shifting hydrological conditions while testing and refining different planting designs. It also highlights humility and communication as essential to problem solving, with input from engineers, policy makers, traditional leaders, and other stakeholders shaping the way forward. We recognize that each stream requires a uniquely adapted approach, and through continuous learning we are steadily improving our restoration "toolbox" while building resilience into both the sites and the program as a whole.

Team of four continuing on planting despite the rain. 26 June, 2025.

Once the pilot site was trimmed and under control, the return of our planting schedule attracted a fresh wave of volunteers. Over the past year, more than 100 different volunteers have joined at the nursery and just under 100 at the stream, reflecting not only the appeal of hands-on work but also the way our activities connect, nursery production feeding directly into planting, which links to education and monitoring. This integration has helped create planting days that feel festive and inclusive, offering work variety that suits a wide range of personalities and abilities. The result is growing momentum and proof that with the right mix of structure and enjoyment, restoration can be both impactful and sustaining.

A mix of MEC regulars and visitors join a vetiver and native tree planting day at Parengaru Stream, 3 July 2025.

Moana, Gemma, and Junya the dog dividing vetiver plants in preparation for planting the following day at the new 40 meter section of Parengaru stream restoration made possible through this fund. 9/7/2025

Mareta and Gemma celebrating the “weed of the day” at the newest section of stream plantings at Parengaru. We try to make the work as fun as possible to keep the volunteers returning and to make sure that the work is sustainable. Creating moments of laughter and lightness like this has been key to retaining volunteers, building friendships, and keeping the energy strong for the long haul. 11/9/2025

The experience at Parengaru complements the larger-scale planting at Ngatoe, showing that MEC is capable of both ongoing incremental work and one-off intensive events. It also underscores the central role of the nursery, whose seed collection, propagation breakthroughs, and rare species research underpin all planting efforts. Together, these approaches are building the foundation for larger initiatives such as the upcoming Tiny Forest, while ensuring that each stream continues to receive the tailored care it requires. Continued funding will allow us to scale these lessons, linking nursery research, maintenance, and volunteer engagement into broader projects.

Future

Looking ahead, we hope to continue all of the work that has carried us this far: seed collection, nursery propagation, riparian planting, and the regular maintenance that keeps these projects alive. We also aim to expand our impact by increasing volunteer satisfaction, enjoyment, and educational opportunities, ensuring that the nursery remains a place where people feel empowered to contribute and connect. Our long-term vision is to one day see thriving corridors of stream and riparian habitat across Rarotonga, where healthy streams are lined with plants that support both human wellbeing and the prosperity of native fauna. By building corridors of healthy streams and riparian habitats, we not only restore biodiversity but also honor our streams as the lifeblood of lagoon and reef health. The nursery will remain central to this vision, both as a production hub and as a community gathering place. A highlight of this period is the invitation to collaborate with the National Environment Service and the University of Newcastle in Australia to establish a Tiny Forest at the next section upstream from our current planting site, a major step in scaling up our restoration efforts and building resilience to climate change.

December 14, 2024 muddy water flowing out of Parengaru showing us that we still have a lot of work to do.