



Digital reef models are helping TNC study coral reef health at Palmyra Atoll. © Gary Andrew

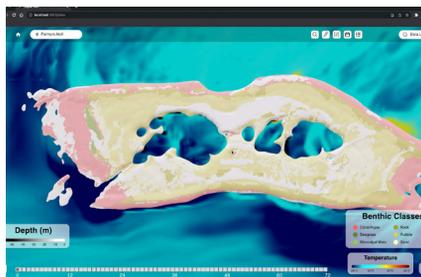
Digital Twin Supports Reef Restoration

Climate change presents a critical threat to the world's coral reefs and the island communities that depend on them. At Palmyra Atoll, TNC works closely with partners from academic, nonprofit and government institutions to study its marine ecosystems and understand what makes reefs healthy in a changing climate, and develop innovative tools to determine pathways to solutions. One such tool is "Digital Reefs."

The partnership is exploring how a four-dimensional virtual replica—or digital twin—of Palmyra's coral reefs can inform reef restoration decisions in Palmyra, Hawai'i and across the Pacific.

"Digital Reefs enables users to visualize how reefs may be impacted by future increases in sea levels and ocean temperatures and how they

may respond to restoration efforts such as propagating and outplanting more thermally tolerant corals," says Joe Pollock, Ph.D., TNC's Senior Reef Scientist and Reef Strategy Lead.



A digital reef model of Palmyra Atoll © Digital Reefs

NASA used 15 digital twin systems to analyze problems, test solutions and ultimately bring Apollo 13 and its crew home safely. Digital twins are now used around the world to develop, test, monitor and improve bridges, buildings, wind farms, aircraft and more, and also inform terrestrial

conservation. TNC and a consortium of partners created the first digital twin for coral reefs in the world.

"This highly interactive tool has the potential to revolutionize coral reef conservation and restoration, allowing communities to better identify and protect reefs that harbor temperature tolerant coral colonies and better propagate these to seed depleted reefs," adds Pollock. "It can also serve as a powerful community engagement tool, allowing community members to explore their reefs, layer in their local knowledge, and tackle their specific needs."

TNC and partners are deploying similar tools to inform reef conservation in Belize, Hawai'i, the Marshall Islands and Palau, with additional interest emerging at other sites around the globe.



TNC coral restoration program manager Julia Rose planting coral pieces in Kahuwai Bay © Liquid Cosmos Divers

Planting coral to restore reefs

The Ka'ūpūlehu Marine Life Advisory Committee and Ho'āla Kealakekua Nui partnered with TNC to launch Kanu Ko'a (Planting Corals) to accelerate reef growth and recovery in Kahuwai and Kealakekua Bays. These science-based restoration efforts encompass local and Hawaiian communities, emphasizing 'ohana (family) relationships with ko'a (coral) and the kuleana (privilege and responsibility) to mālama (care for) this most ancient ancestor.

The work involves collecting and reattaching pieces of ko'a that break off during storms and would otherwise die. Some pieces are planted whole, while others are cut into fragments and planted in clusters directly on the reef to form a colony, or allowed to grow on an in-water nursery table before being replanted. TNC will monitor the growth rates and health of the ko'a over the next year to determine which method is most effective for restoring ko'a on Hawai'i island.

Kanu Ko'a is also helping to build local skills and expertise that will be essential for reef repair and restoration in the coming years as Hawai'i experiences more severe storms and coral bleaching.

Efforts like these remind us again and again that 'a'ohē hana nui ke alu 'ia (no task is too big when done together by all).

Mosquito control project underway

TNC and its Birds, Not Mosquitoes partners have begun releasing non-biting male southern house mosquitoes on Maui and Kaua'i. Just one bite from a mosquito carrying avian malaria can kill a Hawaiian honeycreeper. Without significantly reducing mosquito populations, multiple native birds are likely to go extinct in the wild in less than 10 years. This project could not have happened without substantial state and federal funding; more funding is needed to continue the work.



The Kiwikiu is found only on Maui.
© Bret Mossman

NATURE HAWAII & PALMYRA

Leading With Culture

Kahuwai Bay on Hawai'i Island has harbored communities since Polynesian arrival. The petroglyphs in the area underscore the deep connection with the sea that stretches back a millennium.

When TNC and partners announced plans to restore the bay's coral reef using cultural and scientific knowledge of the area, Kona Village, A Rosewood Resort at the bay, offered their support.



Mike Hoover © Kona Village, A Rosewood Resort

"Our resort principles value the local culture, community and environment," says Mike Hoover, Director of Kona Village Operations. "And supporting this work provides an opportunity to demonstrate our resort's philosophy."

"Kona Village is an important part of the community, and we are thrilled that they supported this restoration project," expresses Lori Admiral, TNC's Director of Philanthropy. "We are lucky to have a resort that understands the importance of incorporating culture and science to benefit both communities and nature."



Participants at Kahuwai Bay © Ryzone Media