

Innovation in Conservation

From Invasive Species-spotting AI to “Digital Reefs,” TNC Hawai‘i and Palmyra Leads the Way *by Ilima Loomis*

Healthy coral reefs absorb up to 97 percent of a wave’s energy, protecting communities and property along Hawai‘i’s coasts. © C. Wiggins

Spotting a patch of invasive tree ferns in an aerial photo of Kaua‘i rainforest seems like a nearly impossible task, requiring someone to pick out the plant’s subtly unique shade of green from a vast and varied green background. But it might be just the job for a computer powered by artificial intelligence.

In fact, the project, a partnership with Amazon Web Services, could help The Nature Conservancy gain the upper hand in the ongoing battle against invasive species. Where it previously took expert human eyes weeks or longer to search aerial photos for signs of pests, AI could potentially spot an invasive Australian tree fern or scaly fern in a few hours. That means ground crews could start mitigation efforts sooner, before the plants have time to spread.

It’s just one example of how TNC is not only using technology to help protect the unique ecosystems of Hawai‘i and Palmyra, but also leading the way for innovation in conservation worldwide.

“New technological advancements are transforming our society daily,” says Trevor Taylor, TNCHP Conservation Director. “TNC is working hard to identify innovative ways of applying these tools, to

accelerate and amplify our conservation impact so that we can better protect and restore the lands and waters upon which all life depends.”

From sensors rugged enough to work in a rain forest, to computer models helping build more resilient reefs, to novel financing tools for ecosystem restoration, TNC is constantly exploring how innovative tools and technology can help solve today’s greatest conservation challenges across different ecosystems and environments.

“It’s really important that we’re incorporating technology and innovation as much as possible so we can do the best work we can with the fewest resources possible,” says Alison Cohan, TNCHP Terrestrial Director. “The conservation needs should drive the technology, so we’re working with the tech companies to develop the right solutions.”

Hawai‘i’s extreme environments make it an ideal location to innovate and adapt technology to conservation work. “Our native watersheds are really, really rugged,” says Cohan. “They’re incredibly hard to get to, so even deploying the technology is expensive. Connectivity is a huge issue. The weather can be gnarly. So

Seabirds, like this adult red-footed booby and chick, are an important part of island ecosystems. © Alex Wegmann/TNC

the more we can automate with things like rugged sensors, that provide connectivity and have batteries that last a long time, it’s not only saving resources, it’s also keeping our crews safer.”

Other innovative TNC projects in Hawai‘i and Palmyra include:

DIGITAL REEFS

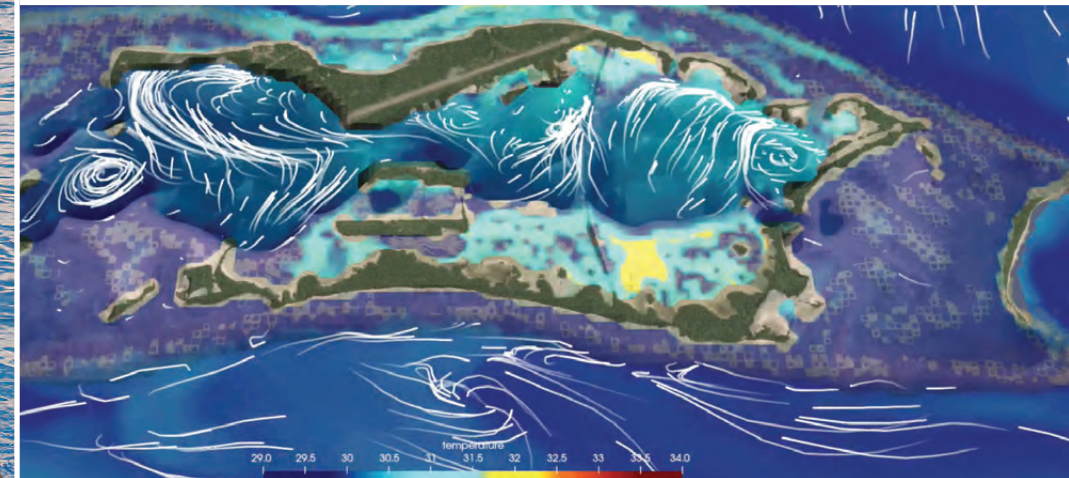
A 3D virtual replica of coral reefs allows researchers and reef managers to simulate different environmental conditions and conservation actions, and then see their outcomes. For example, coral restoration practitioners can virtually plant corals and see where currents will carry their offspring—using hydrodynamic models developed by our partners at Woods Hole Oceanographic Institution. The world’s first “digital reef” is being developed at Palmyra, with similar models in the works for Olowalu on Maui and other important reefs around the globe.

REEF INSURANCE

TNC worked with an insurance broker to develop the first policy for nature in



Invasive tree ferns identified with red dots on a high-resolution aerial image taken of remote forests on Kauai. © Resource Mapping Hawaii



A snapshot of flow and temperature around Palmyra Atoll from the Digital Twin © Digital Reefs



Monitoring allows researchers to recover drifting FADs, like this one near Palmyra Atoll. © Kydd Pollock/TNC

the U.S. It will provide a near-immediate payout to repair Hawai‘i’s coral reefs in the event of a major storm. This tool will provide funding for restoration and repair of coral reefs, enabling a quick response when time is of the essence.

MONITORING SEABIRDS

In 2022, managers launched a seabird monitoring project at Palmyra Atoll, which includes using AI to analyze high-resolution aerial imagery taken by a drone to detect and identify seabirds across the landscape. This technology opens new doors for conservation science and can be adapted for use in other locations.

TRACKING FADS

When Fish Aggregation Devices drift away from fishing areas, they can cause unintended impacts on wildlife. In a program launched with commercial tuna fishery partners, TNC monitors

drifting FADs around Palmyra, collecting biomass data to better understand their impacts on ocean ecosystems, and giving staff the chance to intercept the devices before they become grounded on fragile coral reefs.

FISHKIT

Working with a handful of communities in Hawai‘i and other parts of the globe, The Nature Conservancy developed software to help support local management of small coastal fisheries. Programmers are now updating the software so that it can be applied to fisheries worldwide.

Ultimately, TNC’s focus on technology and innovation is about finding new ways to be effective environmental stewards and community partners, says Emily Fielding, TNCHP marine conservation director.

“We absolutely have to keep innovating to address the challenges of the present—and the future,” she says. “In terms of technology, we want to stay abreast of all the innovations that are constantly happening in our world, and explore how they can help us better protect our natural resources.”