

Critically endangered plant from Kahoolawe gets new life with more than 20 seedlings

By [Mark Ladao](#)

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MARK LADAO / MLADAO@STARADVERTISER.COM

Horticulturist Anna Palomino takes a tray of *Kanaloa kahoolawensis* seedlings from an old bird cage. She is caring for the 23 seedlings, all of which germinated within the last three months, above.



COURTESY ANNA PALOMINO

A heart-shaped seed of a *Kanaloa kahoowawensis* compared with the size of a seed pod.



COURTESY ANNA PALOMINO

Kanaloa kahoolawensis, above, produces a “globose” head of flowers. If female flowers are present and pollinated by male flowers, green seed pods grow out of the head.



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Horticulturist Anna Palomino is housing a wild *Kanaloa kahoolawensis* plant along with its cuttings at her Maui home.

Since April 14, 23 seeds from the *Kanaloa kahoolawensis*, a critically endangered legume that's extinct in the wild, have germinated on Maui. They are the first seedlings produced by a nonwild individual since the species was first discovered on Kahoolawe in 1992.

Anna Palomino, a horticulturist at the Olinda Rare Plant Facility, has been checking up on the seedlings nearly every day. She cares for all of them in her backyard.

In addition to the 23 seedlings, she also cares for and regularly inspects a 12-year-old *kanaloa* plant and two smaller, genetically identical cuttings.

Visually, the plants are about as inconspicuous as one might expect bushes to be. Their most defining features are small green leaves on "sprawly" branches.

Palomino's yard is full of plants both rare and common. The older, larger kanaloa and its cuttings are in a corner, separated from the others.

The large plant grows in a custom-made redwood planter that's 4 feet long on all sides, while the cuttings are in smaller pots at the planter's base. All three are sheltered under a white structure with a roof to protect them from inclement weather.

It's important to keep them safe, because for years the bush and its cuttings were the only healthy individuals of one of Hawaii's rarest native plant species.

But after nearly 30 years on the brink of extinction, the 23 seedlings have given the species new life.

"I've been really concentrated on these guys quite a bit. ... It's pretty exciting because this is the first time we have seedlings, and I've been trying for (about) 12 years," Palomino said. "We were hoping year after year that we'd have seeds, and this is the one year that we did."

Palomino is growing the 23 seedlings in small pots placed in an old bird cage inside a greenhouse. Two of the seedlings germinated from seeds produced by the two cuttings, but 21 came from the older kanaloa plant.

With the recent germination success, the future of the species is brighter than it has been at any point in the past three decades.

The kanaloa went extinct in the wild in 2015, 13 years after National Tropical Botanical Gardens botanists Ken Wood and Steve Perlman found the only two wild individuals ever discovered.

The two plants were in Aleale, a hard-to-reach sea stack on the south side of Kahoolawe. Wood said the stack was home to an intact shrub land, so he rappelled down to and scaled the rocky spire to the shrub land, where he and Perlman discovered the plants.

"No one ever really got to Aleale — it's really a precious setup there," Wood said. "By using binoculars, I was able to tell there was an intact native shrub land."

Since their discovery, the plants were visited regularly and watered, but in 2001 one of them died, likely due to an ongoing drought at the time. Wood collected seeds from the remaining wild plant in 2008 before it also died in 2015.

Two of those seeds were successfully germinated and are alive today. One is being cared for at the Maui Nui Botanical Gardens, although it has only a few leaves left and might die soon, according to General Manager Tamara Sherrill.

The one in the redwood planter at Palomino's home germinated from the other seed. For years, researchers and horticulturists tried — by way of cuttings, cross-pollinating, tissue culturing and other techniques — and mostly failed to produce more individuals from the two cultivated plants.

In 2016 horticulturist Doug Okamoto took two cuttings from Palomino's plant and successfully planted them at Oahu's Lyon Arboretum before returning them to Maui.

That was the most success anyone's had until this year.

After trying to reproduce the kanaloa for the past dozen years, Palomino is excited about its recent good fortune.

"I'm just so mesmerized by these plants. ... I've been drawing them. I've been looking at things that I don't usually look at," she said, referencing parts of the seedlings that have rarely been observed by humans before.

She has several sketchbooks with years' worth of detailed still-life drawings of mature kanaloa plants. She had taken breaks in drawing the plant, but she picked it up again in April when the seeds started sprouting. Now she has drawings of seedlings, too. Though the species has been close to extinction for at least the last three decades, there is evidence that the kanaloa may have been widespread in Hawaii in the past.

Before Wood and Perlman's discovery of the two wild kanaloa plants, core samples taken on Oahu, Maui and Kauai containing fossilized pollen revealed the presence of a once-common mystery legume.

After the two kanaloa plants were discovered, Wood said, their pollen samples were collected and found to match the fossilized pollen.

"When we found the kanaloa, we wondered if it was that mysterious legume that was being found on these other islands," Wood said. "It was showing that it was actually a dominant plant in these islands. So, kanaloa at one time was a dominant component of some of the drier forest systems of the islands."

The kanaloa's demise may have been brought about by extended drought and the introduction of invasive species — both exacerbated by the arrival of humans to Hawaii.

One of the leading ideas for why Palomino's original kanaloa plant hasn't been fruitful during the past 12 years is that it rarely produces female flowers. If it did, they would grow among dozens of male flowers, so the plant should have been able to self-pollinate.

It's not exactly clear why so many healthy seeds were present on the plant this year, but Palomino has an idea.

She said that adding fungi known as mycorrhizae, which associate with the roots of nearly all living plants, to the soil before her original kanaloa flowered may have played a role.

"It got to be used by the plant because it went in the roots. ... I think that made a big difference this time," she said. "I would love to do more research on that."

What appears to be a turning point for the kanaloa could also be considered an environmental and cultural victory for Kahoolawe decades in the making.

In a state decimated by invasive species and deforestation, where half the forests have been cleared over the past 200 years, Kahoolawe might stand out as far as the human-caused destruction it has endured.

In the 1960s and 1970s during the Vietnam War, the island was famously used as a bombing target for the Navy. That included, at one point, 315 consecutive days of bombardment. But even prior to being target practice for the military, Kahoolawe was decimated by ranching by Westerners and from agricultural practices by Polynesians before that.

Protests from environmentalists and Hawaiian cultural practitioners eventually put an end to the bombing in 1990, and since then there have been efforts to restore the natural habitats on Kahoolawe.

Still, the discovery of a new genus and species on such a degraded and dry island came as a surprise.

"Who ever would have thought that this brutalized island would be the place where a new genus would be found?" Wood said.

The kanaloa's success could also be seen as a victory for Native Hawaiians. Kahoolawe was considered a sacred site by Native Hawaiians, and restoration efforts have aimed to make it an appropriate location for spiritual and cultural practices.

Kahoolawe was originally named Kohemalamalama o Kanaloa after Kanaloa, a Hawaiian god. The species, too, is a namesake of the deity, but also of the island.

“Considering the modification of Kahoolawe through various activities — introduction of goats, cattle ranching, modification by the Polynesians for agriculture and survival and also the bombings — to me, for them to find the kanaloa ... (it's) a rebirth,” said Paul Higashino, a natural resources specialist for KIRC.

A 10-year management plan by KIRC and the state's Department of Land and Natural Resources to produce 100 kanaloa plants from cuttings has been proposed to help eventually restore the kanaloa in the wild.

The Plant Extinction Prevention Program, a project of the Pacific Cooperative Studies Unit of the University of Hawaii at Manoa, helps preserve over 200 plant species in Hawaii with fewer than 50 individuals left, and it has targeted the kanaloa plant as a species it will work toward keeping alive.

There are also ongoing discussions about where to send the kanaloa seedlings, but Palomino hopes to keep a few of the plants together to help with pollination efforts. Palomino did not want to take credit for the success of the species that she said many people contributed to, but it's clear that the kanaloa's now-promising future is special to a plant enthusiast like her.

“When I deal with plants, I feel like I'm giving some part of me, you know? It's hard to explain,” she said. “It's this weird, personal interaction that I have with plants.”