



Vol XL No. 2

FALL 2024

# the bulletin

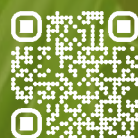
of the National Tropical Botanical Garden



Cultivate a beautiful tomorrow with a legacy gift plan today

Provide a flourishing future for generations of plants and people. To learn more about including NTBG in your legacy plans, please contact Natalie King, Director of Philanthropy at [nking@ntbg.org](mailto:nking@ntbg.org) or (808) 762-1499.

[ntbg.org/planned-giving](https://ntbg.org/planned-giving)



# contents

## 3 MESSAGE FROM THE PRESIDENT AND CEO

## features

## 6 OLONĀ REWOVEN by Brendan Stogner

## 12 A PARTNERSHIP IN PURSUIT OF REVIVAL by Jon Letman

## 24 BROMELIAD CONSERVATION & EDUCATION AT THE KAMPONG by Dr. Brian Sidoti

## in every issue

## 4 NEW MEMBERS

## 11 RED LISTED

## 22 PLANT PEOPLE Exploring people's relationships with plants

## 30 GARDEN SPROUTS News from around the Garden

## 31 WISH LIST

## 32 EYE ON PLANTS Select species in focus



## ON THE COVER

A flush of copper-colored new leaves of Ka Palupalu O Kanaloa (*Kanaloa kahoolawensis*), a previously undescribed genus discovered by NTBG botanists in 1992. Read about the conservation successes and challenges of this Critically Endangered plant on page 12. Photo by Anna Palomino

The Bulletin is a publication for supporters of the National Tropical Botanical Garden, a not-for-profit institution dedicated to tropical plant conservation, scientific research, and education.

We encourage you to share this publication with your family and friends. If your household is receiving more than one copy and you wish to receive only one, please inform our Development Office at our national headquarters at: [members@ntbg.org](mailto:members@ntbg.org).

National Tropical Botanical Garden  
3530 Papalina Road, Kalāheo  
Hawai'i 96741 USA  
Tel. (808) 332-7324  
Fax (808) 332-9765  
[members@ntbg.org](mailto:members@ntbg.org)  
[ntbg.org](http://ntbg.org)

©2024 National Tropical Botanical Garden  
ISSN 1057-3968  
All rights reserved. Photographs are the property of NTBG unless otherwise noted.

Editor: Jon Letman  
Graphic Design: Merriam Fontanilla

-  [www.facebook.com/saveplants](https://www.facebook.com/saveplants)
-  [twitter.com/ntbg](https://twitter.com/ntbg)
-  [instagram.com/ntbg](https://instagram.com/ntbg)
-  [www.youtube.com/ntbgsaveplants](https://www.youtube.com/ntbgsaveplants)





## We are the National Tropical Botanical Garden

We work across five botanical gardens and throughout the tropics to grow a brighter tomorrow for plants and all they sustain. We do so through a biocultural approach, where Indigenous knowledge, community priorities, and scientific research guide our path forward. Together, we will restore flourishing relationships between plants, people, and places.

Limahuli Garden & Preserve

Kahanu Garden & Preserve

Allerton Garden  
McBryde Garden

The Kampong

### Vision

A sustainable future where flourishing relationships are restored between plants, people, and places

### Mission

To enrich life by perpetuating tropical plants, ecosystems, and cultural heritage

## BOARD OF TRUSTEES

### CHAIR

Mr. Gordon L. Deane

### SENIOR VICE CHAIR

Mrs. Wayne Richardson, III

### VICE CHAIR

Ms. Anne G. Earhart

### SECRETARY

Ms. Jan D. Elliott

### SENIOR PRIOR CHAIR

Mr. Thomas D. Hewitt

### PRIOR CHAIR

Mr. Merrill L. Magowan

Mrs. Devon Angelini  
Mrs. Martin Dickinson  
Mrs. Eric P. Fraunfelter  
Ms. Adaline H. Frelinghuysen  
Mr. Peter C. Gardner  
Sam 'Olu Gon, III, Ph.D.  
Mr. Emerson T. Knowles  
Linford L. Lougheed, Ed.D.  
Ms. Elizabeth E. Matthews  
David Rae, Ph.D., OBE  
Professor John H. Rashford, Ph.D.  
Mr. Thomas L. Reveley  
Dr. Michael N. Rosenberg  
Mrs. Raymond L. Salley  
Ms. Anita Seipp  
Ms. Patricia W. Sheehan  
Mrs. Phyllis Evans Swindells  
Mrs. Catherine Topham  
Mr. Robert D. Weist

### TRUSTEES EMERITI

Mrs. Martha W. Cox  
Mr. Patrick Henry  
Mrs. Sally O. Hewitt  
Mr. Thomas S. Kenan, III  
Mrs. Betsy K. Matthews  
Mr. David G. Meissner  
Professor Sir Ghillelan Prance, FRS

National Tropical Botanical Garden  
Chartered by Congress as a not-for-profit, non-governmental institution

## Message from the President and CEO



In this issue of The Bulletin, we celebrate plant success stories that inspire hope for the future. From the Critically Endangered Hawaiian native Ka Palupalu o Kanaloa to the culturally treasured fiber plant olonā, both endemic to Hawai'i, these stories remind us of the importance of protecting our natural heritage. Our efforts to conserve these plants are not merely about preserving biodiversity; they are about nurturing personal connections to the natural world and the plants that sustain us. But how do we foster these connections?

Consider this famous quote by Baba Dioum, shared in 1968 with the International Union for Conservation of Nature, an organization he helped establish:

*"In the end, we will conserve only what we love, we will love only what we understand, and we will understand only what we are taught."*

Dioum's words underscore the importance of education in cultivating a love for the natural world. At NTBG, education is at the heart of our mission. We engage with people of all ages, cultures, and backgrounds to inspire a deep respect for nature and its preservation.

One way we do this is by involving young people in our conservation efforts. By participating in NTBG's educational programs and through hands-on experience, students learn about the critical role plants play in our ecosystems and the importance of conservation. In Hawai'i, I have witnessed the joy and dedication of young adults as they grow to become kumu (teachers), passing on ancestral wisdom and cultural knowledge to future generations.

At The Kampong, our garden in Florida, staff are working with local high school students through summer internships and collaborating with the International Center for Tropical Botany at The Kampong to provide research and curriculum training for high school teachers. This dual approach initiative helps prepare students for careers in tropical botany and related fields while encouraging innovative ideas and fresh perspectives to tackle environmental challenges.

By fostering a sense of responsibility and connection to the natural world, we are empowering our youth to become future stewards of our planet. You can read more about our educational efforts in the article by Kampong director Dr. Brian Sidoti on page 24.

Encouraging young people in these ways gives me immense hope for the future. Their passion, energy, and novel approaches to problem solving are invaluable assets in positively engaging with our complex and rapidly changing world. Seeing their dedication and enthusiasm reaffirms my belief that the next generation will continue to build on our efforts, ensuring the preservation of our natural heritage for years to come.

These are just a few examples that reflect how NTBG harnesses the passion of young minds to build a legacy of conservation and environmental stewardship. Your continued support is vital to this cause and I thank you for your commitment.

Mahalo,

Janet Mayfield  
President and CEO



# A special thank you to our new Fellows and Members!

## Become an NTBG Fellow and join a special group of tropical plant enthusiasts

The Council of Fellows was established in 1985 as NTBG's leadership membership group to advance NTBG's core programs in tropical plant conservation, research, and education. This exceptional group of philanthropists has been instrumental in helping NTBG to become one of the most important tropical botanical gardens in the world. Annual membership dues begin at the \$1,500 level and continue up to the \$20,000 Chairman's Circle level. In addition to enjoying general membership benefits, Fellows are invited to NTBG's bi-annual Board of Trustees meetings and also have the opportunity to participate in specially arranged travel programs, which include visits to private and public gardens and explorations of botanical hotspots around the world.

## Become a Member of NTBG and support tropical plant conservation

Your membership dues directly support tropical plant conservation and research, provide the resources to protect and cultivate our living collections, and educate the public about the importance of tropical plants at NTBG's five gardens and preserves. Membership levels range from \$90 to \$500 with a level to fit everyone from individuals to families. **Contact: [members@ntbg.org](mailto:members@ntbg.org)**

### NEW FELLOWS JAN-JUN 2024

Anne and Peter Anderson  
Catherine and Giles Harrison  
Laura and Kenik Hassel  
Kate Janeway and Howard Wright  
Alison and Robert Leupold  
Linford L. Lougheed, Ed.D.  
Martha Perry  
Mark Reveley  
Carmen Santos  
Hannah and Peter Sirois  
Diane Worthington and  
Dennis Bollschweiler

Brigitte and Georges Bourgoignie  
Anne Boynton-Trigg and Eric Trigg  
Barbara Bradstock  
Mele Brewer  
Judy Brooks  
Laura and Bruce Brosch  
Lucy and Douglas Brown  
Jill Bunney  
Susan and Coleman Burke  
Pamela Burwell  
Kenneth Buscher  
Luba and Stephen Butcher  
Mike Canavan  
Antonia Canero  
April Carlson  
Paul Cassidy  
Bonnie Prouty Castrey and  
Chuck Smith  
Roberto Cepero  
Hana Chang  
Morgan Chatley  
Andrea Johnson and  
Todd Christenson  
Jennifer Cimino  
Mary McDermott Cook  
Dawn Coons  
Maureen and Bryan Costello  
Kalena Costello  
Ruis Gonzalez and Juan Covault  
David Cranford  
Kathleen and Roberto Cueva  
Adrienne Curson  
Thomas Daubert  
Sonya de Long  
Gina de Luca  
MJ Decker  
Alexander Degwitz  
Karen Denunzio  
Karin and Bob DeSantis  
Sarah Devae  
Bernadette and Christian Diegel  
Amy and Mavrice Diericks  
Machi Dilworth  
Grace Dima

Karen and Jon Downie  
Katie Dugan  
Tim Easton  
Joyce and Mark Edlund  
Zella Ellshoff  
Nancy and John Fallis  
Betsy Fell and Katy Scholten  
Robert Fisher  
Jane T.N. Fogg  
Tom Foye  
Seemona Fuchs  
Kirstan Fulton and Joseph Ferring  
Mary K. and David S. Gage  
Cecile Garcia and Vittorio Valenti  
Joan C. and Larry Gehrke  
Daniel Gelfman  
Frank Gencorelli  
Patricia and Neil Getter  
Jenine Gobbi  
William Goell  
Bianca Gonzalez  
Alexis Green  
Claire Greenleaf  
Mary E. and James Greenwell  
Kaye Greff  
Maura and Dale Griggs  
Jamesina Hamilton  
Mary A. Hannah and  
David H. Moore  
JoLetta and Bill Hatfield  
Julie and Richard Haviland  
John Havran  
Amber-Rose Hawkins  
Cheryl Hecht and Ken Stephens  
Emily Hernandez  
Katie Hernandez  
Sophia Hernandez  
May Herr  
Tammy Brown and Jeff Hoerter  
Mary Holcomb  
Lisa Holderle  
Hoku Ho'ohuli  
Danielle and Alex Horn  
Susan Howard

Dian Hudelson  
Margaret Hudson  
Maryanne Ilnickij  
Merlini Ingrid  
Bergina Isbell  
Emily Jackson  
Hannah Janzen  
Melissa Jensen  
Barbara and Tim Johnson  
Cindy and Evan Jones  
Maribeth Joy  
Traci Juhala  
Dimitri Kaczmarek  
Kelly and Gregory Karczmar  
Susanne S. Kayyali  
Nyra Klauer and Jayme Chester  
Karen Knudsen  
Kathleen and Tim Kraft  
Tammy Kush  
Aleksander Kuzmin  
Sonia Lagos  
Genine and Phillip Lance  
Joan Langan  
Helen Cox and John Latkiewicz  
Grace Leahy  
Timothy Legare  
Lorraine Leiser and David B. Taylor  
Philip Leming  
Francesca Leonetti  
Steve Letman  
Elaine Oliveira and Glendon Lewis  
Meriku Lewis  
Leela Lindner and Martin Metz  
Patricia Linton  
Gail Lipsitz  
Katie Lister  
Elyse Litvack  
Debra Loescher  
Simon Lowings  
Nancy Lueck  
Nina and Thatcher Magoun  
Frederick Mais  
Milagros Maldonado  
Erik Mann

Suzanne Manriquez  
Julie Bergholz Markowitz  
Lisa Skyheart Marshall  
Carla Martinez  
Robert McAlister and  
Michael Morgan  
Pamela and Patrick McCabe  
Chelsea McCarthy  
Penelope McIlwaine  
Robin McCoy  
Mary McKenzie  
Cynthia McLean  
Paula McNicholas  
Paul Medeiros  
E. Tyler Miller  
Ines Miyares  
Sonja Moffat  
Carmen Montero  
Jane Morales-Ortega and  
Alvaro Ortega  
Rosa Munoz  
Timothy Murphy  
Lucia Musso  
Karin Myrin  
Tony Nakazawa  
Elizabeth and Thomas  
Niethammer  
Thomas Nolan  
Lisa Nungesser  
Janet Onopa  
Hob Osterlund  
Heather and Larry Ota  
Margaret and Robert Otterman  
Linda and Rick Owens  
Michelle and Mario Panela  
Alice Z. Pannill

Milan Parekh  
Gail Paster and Philip Catapano  
Janet M. and Jay E. Peace  
Seog Soon Pearson and  
Stephen D. Pearson  
Victor Penaloza  
Cresencia and Gregory Perreira  
Gary Person and John Kominoski  
Chris Petruskas  
Barbara and John Picarelli  
Anne Platt  
Leah and Matthew Ponichtera  
Diana and Francis Pratt  
Sara Prem  
Sriranga Veeraraghavan and  
Rajani Rajan  
Tanya Ramseth  
Jean and David Redfield  
Anthony Reed  
Lara Reynolds  
Linda Rhines  
Norma Riley  
Liane and Patrick Rhodes  
Laura Rice and Kima Hardy  
Vicki Richards  
Fausto Rivas  
Dana Romsdal  
Mary Gay Roush  
Silvina Rubinstein and  
Lloyd Kajikawa  
Tai Kerbs and Dave Rudel  
Sona Saha and James Guse  
Marguerite Samuels  
Annie Sanchez  
Robert Sandberg  
Janice and Michael Sanders

Michaela and Mike Sanders  
Ashlee Sanderson  
Martina Schad  
Alisha and Brett Scholer  
Dr. Sandra L. Schultz  
John Seaver  
Priscilla Seimer  
Saikat Sen  
Theresa Shapira  
Lara Shapiro  
Mitali Sharma  
Elizabeth Shelburne and  
Mike Demichele  
Mary B. Sievers  
Dottie Sievert  
Tricia Siletti  
Janet and Michael Sinclair  
Anne and David Sipes  
Eric Smith  
Rachel Snethen  
Jennifer Soman  
Caroline B. Sory  
Michele Soutner  
Jane and Eric Sowder  
Jordan Squire  
Lara and Kyle Strubel  
Lauren Suarez  
Mary and Bert Tarrant  
Linda and Leighton Taylor  
Linda Thorpe  
Richard Till  
Jeanne and Eric Toulon  
Galen Treuer  
Susan Turnbull  
David M. Turner  
Dyanne and John Turner

Linda Tyler  
Cecile and Vittorio Valenti  
Ann and Peter Venardos  
Krista Vernoff and  
Alexandre Schmitt  
Wai Nui Farms  
Nique Waluk  
Lining Wan  
Brad Weigle  
Trisha Aldrich and Mark Wester  
Megan Whilden and  
Igor Greenwald  
Cheryle and Mark Wilcox  
Teresa Wilkins and Nicholas Ward  
Lopaka Williams  
Sarah Nani Williams  
Kristen and James Wilson  
Laura Winter  
Jedda and Hugh Wong  
Matthew W. Wyatt  
Geri and Steve Xydas  
Diana and Jerome Yankowitz  
Vonceil Yara  
Stephanie and Brit Yates  
Sandra and Steven Yegge  
Elissa L. Yellin  
Barbara Young  
Barbara Zuuring

BECOME A MEMBER NOW.



## National Tropical Botanical Garden The Garden Club of America SCHOLARSHIPS

The National Tropical Botanical Garden and The Garden Club of America are collaborating to offer two scholarships related to tropical botany. The Garden Club of America Fellowship in Tropical Botany will award \$5,500 to PhD students. A second scholarship, The Loy McCandless Marks Scholarship (an International Scholarship in Tropical Horticulture or Landscape Architecture), will award \$5,000 to graduate or undergraduate students.

The deadline for both scholarships is January 15, 2025. Learn more at: <https://www.gcamerica.org/scholarships>





# OLONĀ REWOVEN:

Restoring our bonds with the world's  
strongest plant fiber

BY BRENDAN STOGNER, MĀLAMA 'ĀINA TECHNICIAN II

A PATCH OF OLONĀ ON EAST KAUA'I.  
PHOTO BY KEN WOOD

The nettle family, Urticaceae, encompasses a diverse group of plants known for their stinging leaves and rich historical importance. Found worldwide, from temperate to tropical forests, nettles have been integral to human societies for millennia. Beyond their notorious sting, nettles have served as a source of food, medicine, and fiber, weaving themselves into the fabric of many civilizations. In Europe, species like *Urtica dioica* have been utilized for textiles, their strong fibers yielding durable fabrics worn by ancient warriors and modern fashionistas alike. Across Asia, varieties such as *Boehmeria nivea* have been cultivated for their silky fibers, used in traditional garments and papermaking.

Amidst this global tapestry of nettle use, Hawai'i boasts several unique members of the nettle family, including olonā (*Touchardia latifolia*). Olonā is revered for its robust fibers, which have supported Hawaiian culture for centuries. From this endemic Hawaiian plant comes one of, if not *the* strongest and most versatile plant fiber cordages in the world. Cordage made from olonā has a wide array of uses, most notably as fishing line, nets, and various bindings. The relationship between olonā and Hawaiian people embodies not only practical utility but also profound cultural and spiritual significance.

Historically, the process of harvesting and preparing olonā fibers was considered a sacred and specialized skill. It involved careful selection of the plant, stripping the bark to extract the fibers, and then twisting and braiding them into strong cords. Skilled practitioners of this art were highly respected in Hawaiian society. Olonā and the art of cordage-making are deeply embedded in Hawaiian traditions and identity. The knowledge of olonā cultivation and fiber preparation was passed down through generations, ensuring the preservation of cultural practices and the sustainability of natural resources. To care for these plants meant to care for the community.

Historically, olonā has faced pressure from feral ungulates and over harvesting and continues to dwindle in the wild. A parallel decline can be observed in the perpetuation of traditional practices and cultural knowledge. With each diminishing olonā plant, so too wanes the expertise passed down through generations: the knowledge of when and how to gather the plant, the methods to extract its fibers, and the intricate art of weaving them into cordage. This decline not only



CLOSE-UP OF OLONĀ (*TOUCHARDIA LATIFOLIA*) WITH FLOWER CLUSTERS (ABOVE) AND DARK REDDISH VEINED LEAVES (BELOW). PHOTOS BY KEN WOOD





NTBG STAFF OUTPLANTING OLONĀ AND OTHER NATIVE HAWAIIAN SPECIES IN A RESTORED SECTION OF LIMAHULI GARDEN ONCE DOMINATED BY INVASIVE PLANTS. PHOTO BY BRENDAN STOGNER

threatens the biodiversity of Hawai'i's native flora but also erodes a vital link to Hawai'i's cultural heritage. As elders who possess specialized knowledge of olonā grow fewer in number, their traditions and stories that connect olonā to the daily lives and spiritual practices of Hawaiian communities are at risk of fading away.

This issue hasn't gone unnoticed here at Limahuli Garden and Preserve. Our responsibilities in the valley extend beyond the conservation of native Hawaiian plants to include the perpetuation of Hawai'i's cultural heritage. In 2022, plans to cultivate a new site dedicated to olonā within the garden were established, spearheaded by Mike DeMotta, NTBG's now-retired living collections curator, who had witnessed firsthand the diminishing populations of olonā.

Recognizing the urgency of the situation, Mike envisioned a specific site for the cultivation, care, and sustainable harvest of olonā, ensuring the perpetuation of both the plant and its cultural practices. Limahuli Garden and Preserve director, Lei Wann, along with

horticulture specialist, Randy Umetsu, joined Mike in scouting potential sites within the garden to bring this idea to fruition.

In the wild, olonā typically thrives in very wet, shady areas along streams, often under a heavy tree canopy or in dark gulches. When selecting an ideal site for cultivating olonā, several critical questions arose: Is the site sufficiently wet? Is it cool? If not, can these conditions be artificially created? After careful consideration, staff decided on a triangular, one-acre area of Limahuli Garden previously called the "Invasive Forest Walk" nestled between two ephemeral streams. At the time it was overgrown with invasive plants, but the team recognized its potential.

Shortly after the site was chosen, I started working as a horticulture technician in the garden. Having read accounts of olonā cordage being preferred by mountain climbers and ship captains, I was fascinated that one of the world's strongest plant fibers was endemic to Hawai'i.



LIMAHULI GARDEN AND PRESERVE STAFF RANDY UMETSU COLLECTING OLONĀ SEEDS ON KAHILI MOUNTAIN. PHOTO BY KASSIE JENSEN



While fully committed to the project, we recognized the daunting task before us. With support from local arborists, we began systematically clearing invasive mango, octopus trees (*Schefflera actinophylla*), and banyans. But as the dense canopy receded, sunlight reached the forest floor, awakening a deluge of weeds. Undeterred, we diligently weeded, mulched, and left felled trees to decay, fostering a habitat for native fungi to break down the debris.

Our efforts revealed promising signs: māmakī (*Pipturus albidus*) seedlings, another native nettle renowned for making tea and cloth began to emerge as though the valley itself supported our work. After welcoming school groups and hosting community and volunteer days to prepare the site, we organized a staff planting day in August 2022, introducing hundreds of native Hawaiian plants including some 40 olonā.

As we worked, we recited Pule Ho’oulu, a Hawaiian oli (chant) that invokes rain and new growth, while Hawaiian practitioners blessed the space. Once the site was planted and new irrigation installed, all we could do was wait and watch as māmakī seedlings formed a sheltering canopy over the young olonā plants. Under the protective shade, the olonā thrived, transforming the once invasive forest walk into a fully functional native Hawaiian agroforest.

Two years later, the site is healthy and growing with nearly 50 robust olonā and thousands of other culturally significant plants. For Limahuli’s horticulture staff, a major focus has been collecting specimens from as many of Kaua’i’s

olonā populations as possible to ensure diverse genetic representation in the new site.

Currently, we have olonā from six areas, each displaying distinct morphological characteristics. Additionally, we’re reaching out to more experienced growers to enhance our knowledge of this notoriously difficult-to-grow plant.

In the future, I envision thousands of thriving olonā, creating a space where cultural practitioners can regularly harvest and learn about this incredible plant. Rather than a rigid “look but don’t touch” approach, this can be a place to foster a deeper relationship for this community and the land.

Personally, I feel deeply connected to this site because my journey at Limahuli began alongside the olonā plantings and in this valley we’ve grown together. Our efforts go beyond saving one plant species; we aim to safeguard an essential aspect of Hawaiian identity, perpetuating the centuries-old connections between people and plants.

By revitalizing the cultivation and sustainable management of olonā, we aspire to ensure that future generations inherit not only its physical resources but also the invaluable cultural legacy it represents. 🌿



READ AND  
SHARE  
ONLINE



LIMAHULI GARDEN AND PRESERVE DIRECTOR LEI WANN STRIPS BARK FROM OLONĀ PLANTS ON THE NORTH SHORE OF KAUA’I. PHOTO BY EZIKIO QUINTANA

# red listed

The International Union for Conservation of Nature (IUCN) publishes the online resource, The IUCN Red List of Threatened Species, ranking taxa (species, subspecies, or varieties) in one of nine categories from ‘Not Evaluated’ to ‘Extinct’. The Red List is an invaluable tool for not only scientists, educators and policy makers, but for anyone seeking a better understanding of the conservation status of plants and animals around the world.

In recent years, conservation agencies, institutions, and organizations including NTBG have increased efforts to assess the nearly 1,400 native plant taxa in Hawai’i. To date, over half have been assessed, reviewed, and published on the Red List, adding to the more than 66,500 plant taxa published through the latest update of the Red List worldwide. In 2021, NTBG scientists completed assessments of all Kaua’i single-island endemic vascular plants (currently at least 256 species).

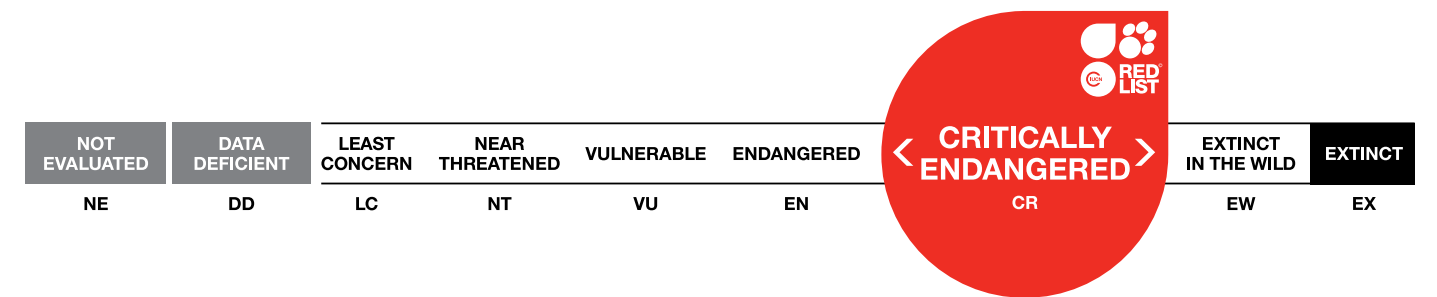


PHOTO BY JON LETMAN

## Species: Koki’o ‘ula’ula (*Hibiscus clayi*) Malvaceae

**IUCN RED LIST CATEGORY: CRITICALLY ENDANGERED (CR)**

*Hibiscus* is a beloved genus of flowering plants in the family Malvaceae comprised of several hundred species. Hawai’i has 13 native taxa, 12 of which are endemic, plus many ornamental species and cultivars. Koki’o ‘ula’ula (*Hibiscus clayi*) is a Kaua’i single-island endemic species with a relatively long history in cultivation. In the wild, koki’o ‘ula’ula grows four to eight meters high with beautiful red to pink flowers found in dry and mesic forests. Around 100 mature individuals among two subpopulations remain in the wild. Threats include pigs, goats, and rats, and competition by non-native invasive plants. Koki’o ‘ula’ula and its habitat continue to decline.

In partnership with the Chicago Botanic Garden, we are working to assess the genetic diversity of managed plants in ex situ (outside its natural habitat) collections compared to wild populations and use data to inform how collections can best support efforts to reintroduce plants to the wild.

This work includes pollen banking research led by NTBG’s Seed Bank and Laboratory in order to conduct strategic hand pollination crosses. Additionally, a University of Hawai’i Master’s botany student is working with our collections under NTBG mentorship to conduct a breeding system study to help determine the effects of inbreeding on plant vigor and survival.

—Dr. Seana Walsh, Conservation Scientist and Curator of Living Collections



# A PARTNERSHIP IN PURSUIT OF REVIVAL

Once nearly extinct, Ka Palupalu O Kanaloa sees a hard-fought resurgence

BY JON LETMAN, BULLETIN EDITOR

Anchored in the rain shadow of Haleakalā, Maui's towering volcano, the smallest of Hawai'i's eight high islands rises from the sea. At just 45 square miles, Kaho'olawe is less than one-sixteenth the size of Maui. And while the once inhabited island has no permanent settlements today, for centuries it has been considered wahi pana — a storied place — revered as a fertile bed of Hawaiian culture and spirituality.

Kaho'olawe is known by several names including Kohe Mālamalama O Kanaloa and is closely associated with Kanaloa, an akua (what Western definitions would describe as a god or deity of the ocean). Kaho'olawe is one of four Hawaiian Islands that as recently as 150,000 years ago comprised a greater land mass called Maui Nui<sup>1</sup>.

Since European contact, Kaho'olawe has been subjected to waves of destruction stemming from Western colonization and militarization. In 1793, goats were introduced to the island, and later cattle and sheep, degrading topsoil and causing erosion. In 1941, the island was taken over by the U.S. Navy for use as a ship-to-shore gunnery and bombing range.

In 1976, a grass roots Hawaiian group called the Protect Kaho'olawe 'Ohana (PKO) launched direct actions to liberate the island and in the early 1990s the bombing was halted, ordnance removal started, and in 1993 a decade-long process of transferring control of the island back to the state of Hawai'i began.

<sup>1</sup> Maui Nui (literally "big Maui"), was comprised of Maui, Moloka'i, Lāna'i, and Kaho'olawe, and estimated to have measured 5,640 sq. miles some 1.2 million years ago, according to the U.S. Geological Survey.



KA PALUPALU O KANALO GROWING  
ON 'ALE'ALE, COASTAL KAHO'OLAWE.  
PHOTO BY KEN WOOD.



## FOUND ON THE EDGE

It was on the vernal equinox of 1992 that NTBG botanists Steve Perlman and Ken Wood were participating in a Nature Conservancy of Hawai'i botanical inventory of Kaho'olawe. The decades of bombing, overgrazing, drought, and erosion had transformed much of the island into a dense, dry hardpan but it still harbored previously undescribed Hawaiian plants.

While exploring the high cliffs on Kaho'olawe's southern coast, Steve and Ken spotted what appeared to be a mixed native coastal shrubland on 'Ale'ale, a small, steep rocky promontory that juts into the water, barely connected to the island by a narrow bridge of crumbling rock and talus.

Recognizing that they both couldn't go safely, Ken used a 50-meter rope to rappel down to the spire while Steve stayed back to monitor the line just in case. Once he had reached 'Ale'ale, Ken looked up to find what he

describes as two unfamiliar "tightly woven shrubs" which resembled members of the legume family (Fabaceae)<sup>2</sup>. Climbing some 170 feet above the water, Ken discovered the mysterious shrubs were both flowering and one bore fruit. The two mysterious shrubs were surrounded by the remains of other identical plants – all dead.

That first encounter yielded a collection of viable seeds and plant material which the botanists presented to legume experts at New York Botanical Garden (NYBG) and botanist Ray Fosberg, a specialist in the Hawaiian flora who immediately suggested the discovery might be a "fabulous new genus."

Further investigation by scientists at NYBG and Fordham University<sup>3</sup> determined that the pollen of this mystery legume was a perfect match for fossilized pollen previously found in core samples from O'ahu's north shore and elsewhere in Hawai'i. This newly discovered legume, the evidence indicated, was once widely distributed

<sup>2</sup> Read Ken Wood's account of botanizing on 'Ale'ale in *The Bulletin* Vol. XXXIV No. 1 (Winter-Spring 2018)

<sup>3</sup> Conservation paleobiologist Dr. David Burney played a key role in identifying Kanaloa's pollen. Dr. Burney later served as NTBG's director of conservation.



LEFT: CLOSE-UP OF YOUNG FOLIAGE OF KANALOA KAHOOLAWENSIS. PHOTO BY MIKE OPGENORTH  
RIGHT: SIXTEEN-YEAR-OLD KA PALUPALU O KANALOA "MOTHER PLANT" IN A REDWOOD PLANTER GROWN FROM SEED. BESIDE IT, TWO YOUNGER PLANTS GROWN FROM CUTTINGS. PHOTO BY JON LETMAN



NTBG BOTANIST KEN WOOD COLLECTING SEEDS FROM THE LAST KNOWN KA PALUPALU O KANALOA ALONG THE COAST OF KAHO'OLAWE IN 2009. PHOTO BY JAMIE BRUCH/KAHO'OLAWE ISLAND RESERVE COMMISSION

throughout much of Hawai'i and probably grew alongside a'ali'i (*Dodonaea viscosa*), loulou (*Pritchardia*) palms, and other native plants to form coastal dryland forests long before the first humans arrived.

When NTBG scientists Dr. Dave Lorence and Ken Wood published their scientific description of the new legume, Dave named it *Kanaloa kahoowawensis* in recognition of the island and its namesake deity. This was not only a new species and genus, but was in fact a monotypic genus (having only one species) and Hawai'i's first newly described flowering plant genus since Joseph Rock discovered *Hibiscadelphus* in 1911.

The plant was given the Hawaiian name Ka Palupalu O Kanaloa in recognition of its softness and the balance it adds to its surroundings. Although considered extinct in the wild, the plant is currently assessed as Critically Endangered with just 16 remaining individuals growing ex situ (outside its natural habitat) at several managed sites on Maui.

After this first encounter with Kanaloa, Ken and other conservation partners took extraordinary measures to keep the two last known wild plants alive, going so far as to deliver water by containers via a perilous helicopter drop off.

In 2015, the last of the two known wild plants was declared dead but the live material that was collected

has been propagated from seed and reproduced by cuttings, growing into new plants which today are being cared for by a network of conservation partners across Hawai'i. That group, called the Ka Palupalu O Kanaloa Partnership, has been meeting regularly for over a decade to share information and discuss conservation strategies.

Members of the partnership, including NTBG, have tried to grow Kanaloa in planters, but in some cases these plants succumbed to pests and disease. During the same period, botanists conducted plant surveys on Kaho'olawe, searching on foot and by air, hoping to find more wild Kanaloa, but to date none have been found. Encouragingly, several successes propagating Kanaloa offer new hope.

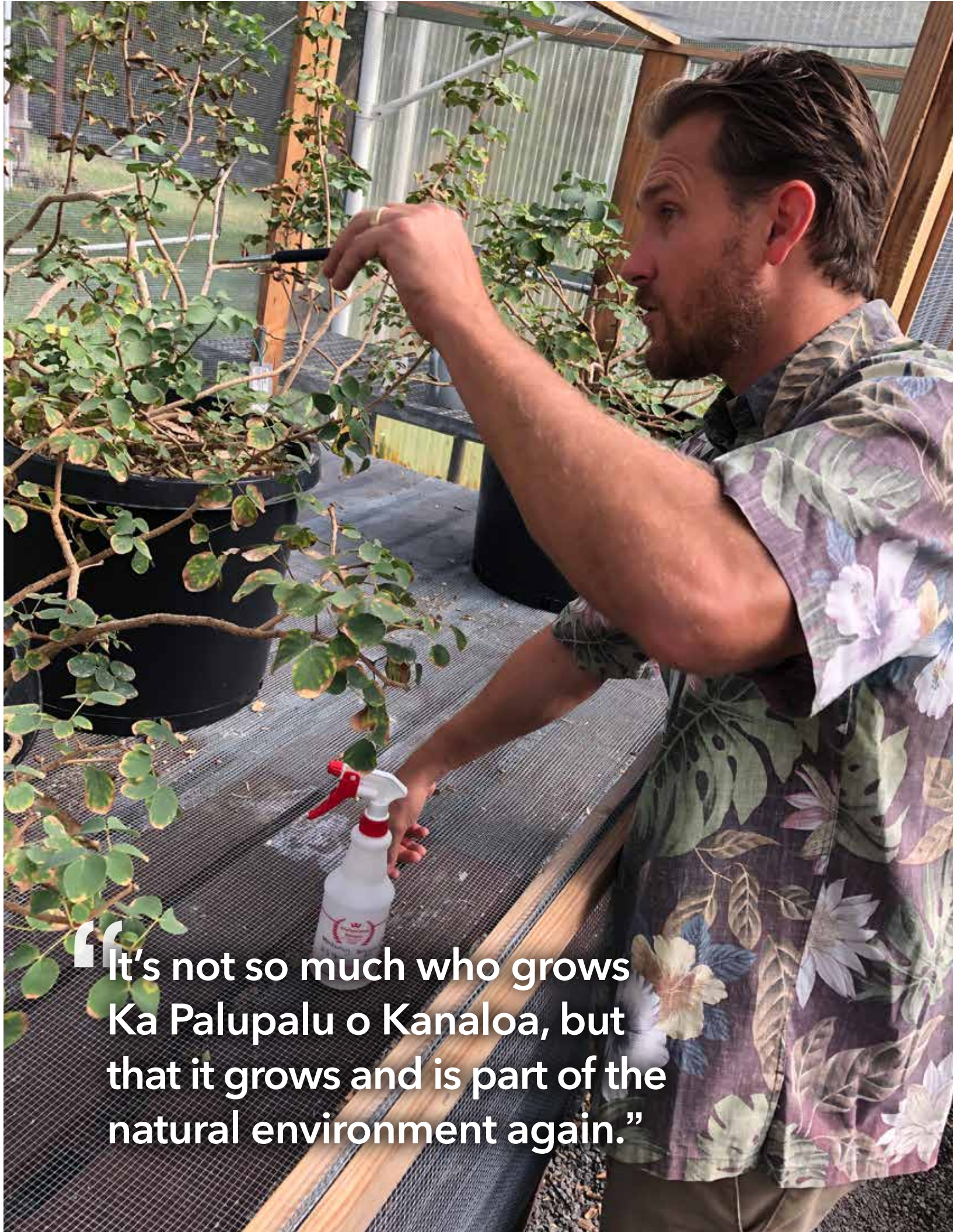
## THREATS AND CHALLENGES

In recent years, drought has become more persistent and severe in Hawai'i, affecting an already arid Kaho'olawe. The lack of rain, along with the impact of invasive plants like baffle grass (*Cenchrus ciliaris*) and the spread of small mammals (cats and mice) makes the island a challenging environment for restoration. Furthermore, roughly 70% of the island has been surface cleared of unexploded ordnance but the risk remains, and live rounds are still found on land, a problem exacerbated by erosion. Bombs can still wash up along the shoreline at any time.





CJ ELIZARES INSPECTS KA PALUPALU O KANALOA PLANTS GROWN FROM SEEDS OF THE "MOTHER PLANT." (OPPOSITE) MIKE OPGENORTH CARES FOR KANALOA PLANTS INSIDE AN ENCLOSURE. PHOTOS BY JON LETMAN



“It’s not so much who grows Ka Palupalu o Kanaloa, but that it grows and is part of the natural environment again.”





ANNA PALOMINO WITH KA PALUPALU O KANALOA.  
PHOTOS BY JON LETMAN

Jamie Bruch, a conservation biologist with the Kaho'olawe Island Reserve Commission (KIRC), has been working with NTBG and other partners to collect Kanaloa seed and genetic material. He explains that the survival of Kanaloa is an important element of restoring Kaho'olawe's dryland forests.

KIRC has co-authored a management plan that serves as a guiding document for the partnership.

## GUARDIANS OF KANALOA

At the center of Kanaloa conservation is Anna Palomino, a senior horticulturist with the University of Hawai'i Center for Conservation Research and Training. Anna grows rare and endangered species for outplanting in the wild and has been working with Kanaloa since 2008 when she had her first opportunity to propagate a seed collected by Ken Wood.

Recently, one hot summer morning, Anna took time out to introduce the young Kanaloa plants she is tasked with caring for under a contract from Hawai'i's Division of Forestry and Wildlife (DOFAW). She was joined by CJ Elizares who works with PKO, leading a crew of young Native Hawaiian conservationists to remove invasive plants reintroduce native near-shore species in Makena on southwest Maui.

Seated on low black plastic nursery benches beneath a shade cloth, Anna and CJ explain that with so few Kanaloa remaining, there is tremendous pressure to prevent it from going extinct. Anna describes the challenges of growing this most-demanding species. Kanaloa, she says, goes through many different growth stages and is frequently dormant. It's sensitive to pesticides and prone to root rot. Rats love the seeds. It's also highly susceptible to insects, spider mites, snow scale, fungal diseases, and other plant pathogens.

As a slow-growing woody shrub, Kanaloa cannot be cloned as easily as herbaceous plants. When Kanaloa flowers (infrequently), it produces a ball-shaped cluster of mostly male flowers, with female flowers fewer in number and difficult to find, making pollination opportunities rare.

Efforts to air layer and graft Kanaloa have been mostly unsuccessful and cloning from cuttings has had limited success (two cloned plants live beside the oldest "mother plant"), but in general, it's difficult to obtain planting material. Now, with just 16 plants, the diversity and vigor found in a large plant population is absent, making recovery even more challenging.

"It's a pretty complicated plant," Anna says, with a mix of resignation and admiration.

Today's small but resurgent Kanaloa population ranges from the largest mature mother plant which has provided seed and pollen to more than a dozen young plants. Live plant tissue is stored at the University of Hawai'i's Lyon Arboretum with frozen pollen kept in storage at a USDA facility in Colorado.

In the 15 years that she has worked at this plant facility, Anna has watched as the environment has grown drier and warmer. In August 2023, ferocious winds destroyed one greenhouse, and the subsequent wildfires that caused so much destruction on Maui, came perilously close to a site where more than half the entire population is growing.

But there have been great successes too.

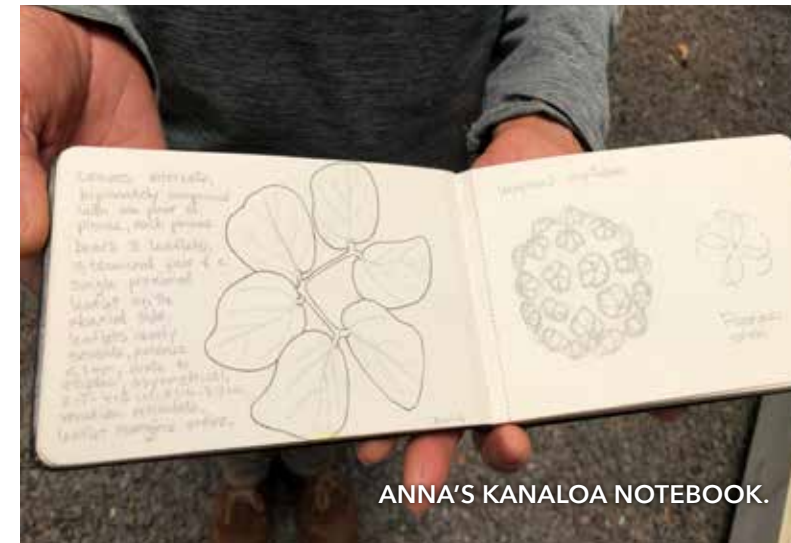
In 2016, scientists at Lyon Arboretum made a major breakthrough when, after many attempts to grow from seed and other techniques, they were able to propagate plants from cuttings.

Then, in 2020, Anna had her own breakthrough when the mother plant produced male and female flowers with many seed pods. With more than 20 viable seeds, Anna was able to propagate and start seedlings, more than a dozen of which still survive today.

Since she started caring for Kanaloa, Anna has closely observed every aspect of the plant, taking meticulous notes and making drawings to record the plant's behavior and habits. For example, when the plants were at their most vulnerable state, she took them indoors at night and in doing so, noticed that the leaves fold closed until morning. With such a rare, virtually unknown plant, her notebook has become her own guidebook based on firsthand experience.

In 2023, a lone Kanaloa accession with a single seed was withdrawn from NTBG's seed bank and transferred to Anna. She successfully germinated the seed, producing what is now a year-and-a-half old plant.

Today, this "all of the above" strategy continues, trying to get plants to flower and seed with efforts to propagate from cuttings and tissue culture at Lyon Arboretum's tissue culture lab. Additionally, DOFAW-operated fog-bench propagation system on O'ahu offers new hope for Kanaloa cuttings.



Caring for a monotypic genus that was down to a single known individual, she says, has been a huge responsibility with the threat of extinction a heavy burden to bear alone which is why this group approach to conservation is so important.

## FROM WARRIORS TO HEALERS

CJ explains how, just as a new era was dawning on Kaho'olawe in the early 1990s and PKO was contemplating its own future, along came Kanaloa, a plant in need of help. "We realized that we needed to shift our mindset and vision from being warriors to fight for the island to be healers of the land and work for the plant."

Rather than looking at Kanaloa with pity, as if it were the last of its kind, CJ takes an alternate view, saying he envisions these as the *first* plants to go back into the soil, to grow and repopulate the island. He and his crew look to the plant for guidance. When a particular plant grows tall and straight, he says it is the time to stand up and be assertive. If another plant grows low to the ground, it may be time to lay low.

Ka Palupalu O Kanaloa, represents more than the ocean and an island, says CJ. The plant is a kinolau (living embodiment) of the akua bearing the same name. "When plants have names that are attributed to something that we can identify with...to dedicate a name to care for the species is important." Just as Anna cares for the plants like her children, he says, "we have that relationship to the plants." Kanaloa is "part of our system, part of our people, part of our fiber of who we are."

Also on Maui, NTBG's Kahanu Garden staff are playing an active role in caring for three plants being grown in a wire enclosure to protect against rats.

As Mike Opgenorth inspects the plants, he sees growing Kanaloa in multiple sites that vary in elevation, temperature, and rainfall as a way to better inform decisions about potential suitable future



habitats. He asks, was the hot, dry, rocky habitat of ‘Ale‘ale the ideal environment for Kanaloa, or did it just happen to be the last place it was found alive?

This lack of historical data and guesswork is countered by robust discussions among the partnership, Mike says. Doing so also helps share the responsibility to care for the plants among multiple stakeholders. An important element of this inter-agency cooperation is the integration of connection to place and cultural context.

### PURSUING AN END GOAL

What is the end goal for conserving Kanaloa? For Anna, it’s simple: she wants to see more flowering, more pollination, more viable seeds, and more plants.

Building on the partnership’s recent successes, CJ is eager to see Kanaloa plants translocated from managed facilities to being planted out on Kaho‘olawe. “My hope is not a bleak one. My hope is that’s where they belong, that’s where they should go, and that’s my goal.”

KIRC’s Jamie Bruch says it would be ideal to have three propagation facilities, each with 100 plants before the others were returned to the wild. Having 300 plants would increase the likelihood that a Kanaloa population could be re-established on Kaho‘olawe and in habitats where it was once abundant.

Matt Keir, a botanist with Hawai‘i’s Department of Land and Natural Resources’ Division of Forestry and Wildlife, manages the Plant Extinction Prevention Program (PEPP) which specializes in conserving Critically Endangered Species with 50 or fewer wild individuals. Having worked with Kanaloa for 25 years, he says that “the future of this plant is with people.”

Ideally though, Matt hopes the plant will be returned to a functioning ecosystem where it can survive with as little intervention as possible. Before that can happen, he says it makes sense to have a large source of cultivated plants that can provide planting material because it is almost guaranteed that a certain number of outplanted individuals will not survive.

Another outcome of group efforts to perpetuate Kanaloa is to strengthen the relationships forged between diverse interests who each have their own approach, experience, and abilities, but share the goal of preserving plant life in Hawai‘i. That conservation ethic can be replicated and passed down to the next generation.

Mike Ogenorth says the partnership is vital for survival of Kanaloa because even the best horticulturist in the world will not have success 100% of the time. He sees great benefits to having multiple perspectives working with such a rare plant. It’s not any one organization, agency, or individual, it’s a team effort that shares the responsibility for perpetuating the plant.

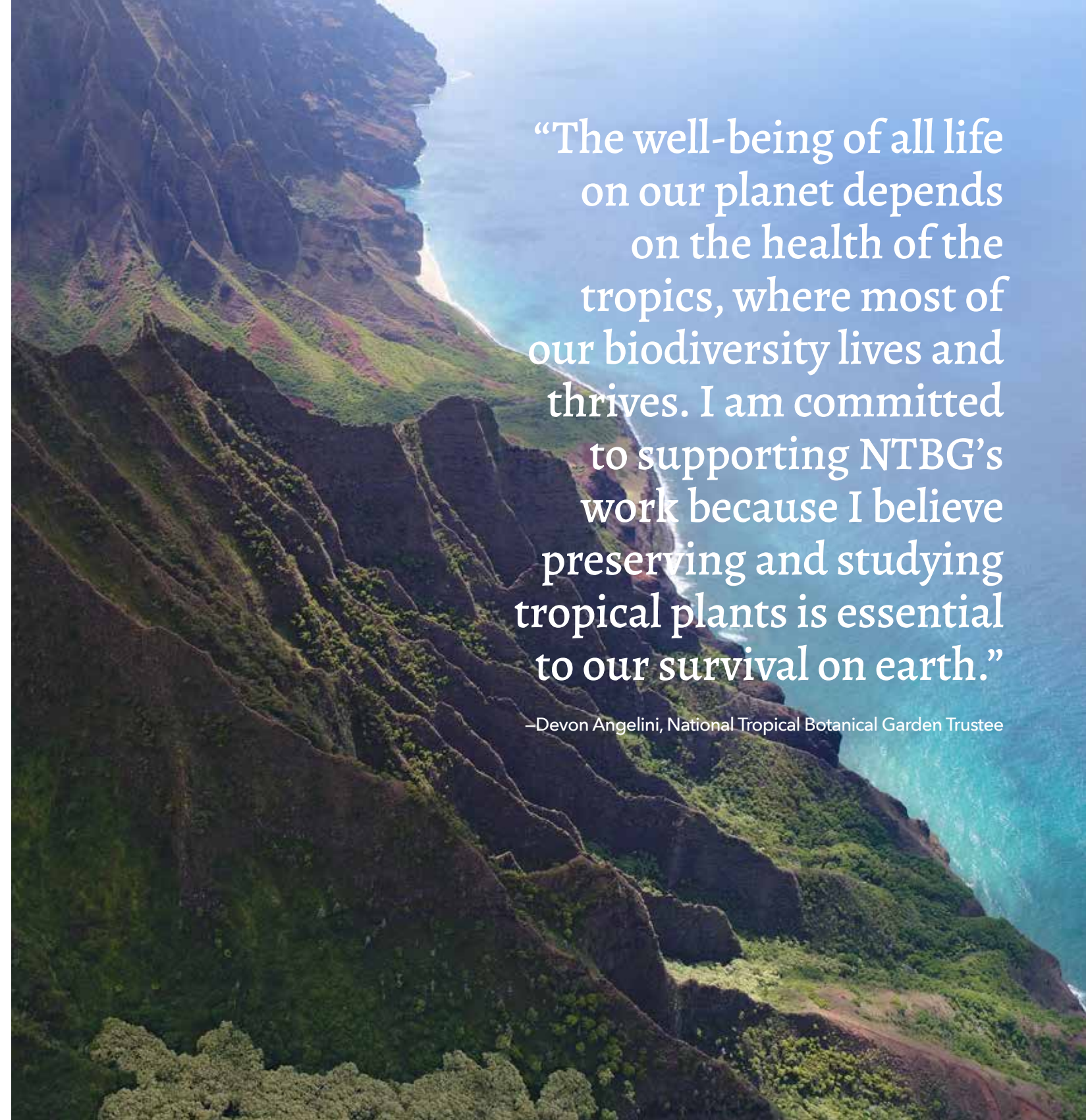
“We think it’s a good case study for what we could do for other species that we’re trying to protect that require this level of attention,” Mike says. What’s really important about Kanaloa conservation, he adds, is not who grows the plant, but that it grows. 🌿

READ AND  
SHARE ONLINE



## THE KA PALUPALU O KANALOA PARTNERSHIP

- Harold L. Lyon Arboretum
- Ho‘olawa Farms
- Kaho‘olawe Island Reserve Commission
- Mākena ‘Ōiwi Resources & Stewardship
- Maui Nui Botanical Gardens
- Maui Nui Plant Extinction Prevention Program
- National Tropical Botanical Garden
- Protect Kaho‘olawe ‘Ohana
- State of Hawai‘i Division of Forestry and Wildlife
- US Fish and Wildlife Pacific Islands Fish and Wildlife Office



“The well-being of all life on our planet depends on the health of the tropics, where most of our biodiversity lives and thrives. I am committed to supporting NTBG’s work because I believe preserving and studying tropical plants is essential to our survival on earth.”

—Devon Angelini, National Tropical Botanical Garden Trustee



Join plant advocates like Devon Angelini in protecting our planet’s future. Our collective well-being depends on the health of the tropics. By supporting the National Tropical Botanical Garden, you can make a difference. Whether you choose to become a member, make a donation, or volunteer your time, your contribution will help preserve the vital biodiversity that sustains life on Earth.

Visit [ntbg.org/support](https://ntbg.org/support) to learn more and get involved today.



## EXPLORING PEOPLE'S RELATIONSHIPS WITH PLANTS



CONTRIBUTED PHOTOS

### DR. SAM 'OHUKANI'ŌHI'A GON, III

Sam 'Ohukani'ōhi'a Gon, III was born and raised in O'ahu's Nu'uano Valley. As a child, he was surrounded by plant enthusiasts and recalls helping his grandfather care for orchids. After school Sam loved to wander into the forest, explore streams, and examine the natural world around him.

After joining his high school hiking club, Sam started to learn the names and stories of Hawaiian plants, and as he learned more, he became interested in growing native plants.

With his love of nature's diversity, even as he pursued a zoology degree at the University of Hawai'i, he took botany classes so he could understand how plants and animals interact within their environment.

For more than 35 years, Sam has worked for The Nature Conservancy of Hawai'i. Since 2021, he has been an NTBG Trustee. Today, Sam still lives in the Nu'uano Valley in a home he has landscaped with towering native and tropical edible fruit trees.

### You're known as an arachnophile – you love spiders. How do spiders and plants intersect?

The happy-face spider (nananana makaki'i) is one of a small guild of subfoliar (leaf-related) spiders. They don't build a web in a conventional sense. They live on the underside of leaves so to find one, you need to understand what type of plants they like to live under. Typically, they'll go for a relatively large convex leaf with a strong attachment and a long foliar life. There are many plants in native forests that will hold onto a plant for a whole year and happy-face spiders live just a year so when it chooses a leaf to live under, it's very likely that leaf is going to be its home for its entire life.

### Do you have a favorite way to interact with plants?

My favorite way of interacting with plants is just admiring their beauty and adaptations when hiking in a forest. That way I can enjoy every single plant that I find. You come to understand what the needs of plants are by spending a lot of time observing them in their habitat. It has proven very useful to me since I understand what my windy, relatively dry ridge environment is like and I can select those plants that I've seen thrive in those environments and place them around me in my yard and know that I could go away for a month and they'd probably still be fine.

### Can you talk about the importance of knowing native Hawaiian plant names?

Hawaiian nomenclature was often binomial, just like scientific nomenclature with genus and species. If you look at 'ōhi'a for example, there's 'ōhi'a 'ai, 'ōhi'a lehua, 'ōhi'a hā, 'ōhi'a moewai. It's interesting to know that each of those refers to a closely related plant. In Hawaiian taxonomy, it was all based on empirical observation of similarities of plants and the names assigned to them.

### How does your love of reading intersect with your relationship with plants?

I love to read. I love to write also. I am a teacher of Hawaiian chant and there are many collections of Hawaiian chants and songs which often celebrate plants. There are so many love songs that mention the interactions between plants and animals, for example. The i'iwi is our scarlet honeycreeper and the way that the i'iwi eyes lehua blossoms and seeks them in the forest to get a sweet sip of nectar is one obvious poetic reference to the desire of one person for another.

One of the reading sources that I really enjoy is going through Hawaiian language newspapers. As a person who can speak and read Hawaiian fairly fluently, I enjoy searching the Papakilo database which has one of

the largest collections of digitized newspapers, and search for particular plants or places and look at the descriptions in the chants and the stories of those places and find, often surprisingly, the same plants that were described hundreds of years ago are still there and still characterize those places. It's a wonderful way to go back in time through the eyes and writings of others to get a description of the environment and the plants that grew there.

### Do you have a favorite plant book?

Joseph F. Rock's *The Indigenous Trees of the Hawaiian Islands* is one of my favorites. Another is Otto Degener's *Plants of Hawai'i National Park*, largely because he was a storyteller. He loved finding little anecdotes about particular plants. In his book he gave a description of how to use *Sisyrinchium acre* (mau'u lā'ili), which is a native iris, to make a temporary tattoo.

### Do you talk to plants and, if so, what do you say? And do they answer back?

As a kahuna kākālaleo (practitioner of chant and protocol), chanting on entry to forests, chanting before you pick a plant for lei or medicine or is one of the traditional ways of communicating your intent and asking for permission to pick your plants, so yes, I do. I don't talk to them in English but I chant at them. Answers aren't in the form of an oral reply. Answers are in the form of feelings that are right or wrong if you're in those kinds of situations. So, you pay attention to the signs that the world gives you after you offer your chant.

### Can you talk about your appreciation of the depth and details of plant life?

I love regional plants. I love special plants. I don't appreciate plants just because they're green and they look nice. Most people who visit Hawai'i will look up in the mountains and say, "oh, everything is green and lush."



They have no understanding of what kinds of conservation challenges and how many rare plants there are. What role invasive species play. They may not even know the difference between a native plant and an invasive weed. It all boils down to depth of understanding. It gives you a much greater appreciation for what we have and what to do.

### Do you have a favorite ecosystem or plant environment?

I love higher elevation settings. One of my favorites is high elevation montane 'ōhi'a forest on pink pāhoehoe lava. If you can picture the slabs of smooth lava with cracks between them and trees coming up through the cracks offering shade. The silence of the high elevation and the cool air and the dark blue sky coming through the 'ōhi'a foliage – here's something magical about being in that environment.

### If you could introduce one Hawaiian plant to the entire world, what would it be?

'Ōhi'a lehua is the backbone of Hawaiian watersheds and a keystone plant of our ecosystems and it's so variable from sea level up to tree line. There are so many things to say about that plant – about its ecological significance, it's hugely culturally significant, it's a patron plant of hula, of the god of war, of so many aspects of Hawaiian culture. Its wood is beautiful, the flowers are gorgeous, so that would be one of the plants that I would introduce. There are many others though. It's very hard to choose just one!

*This interview was edited for length and clarity.*





BRIAN SIDOTI (LEFT) AND COLLABORATORS INSTALL A WEATHER STATION IN A TILLANDSIA HOST TREE AT MYAKKA RIVER STATE PARK NEAR SARASOTA, FLORIDA  
PHOTO BY BRAD OBERLE

# Bromeliad Conservation & Education at The Kampong:

*Protecting Our Canopy Ecosystems*

BY DR. BRIAN SIDOTI, DIRECTOR OF THE KAMPOUNG

Florida is home to a diverse range of flora, including 16 native bromeliad species and two natural hybrids. These unique plants, which are part of the Pineapple family (Bromeliaceae), play a critical role in their ecosystems. From the iconic Spanish moss (*Tillandsia usneoides*) to the pseudo-carnivorous powdery strap airplant (*Catopsis berteroniana*), Florida's native bromeliads grow in tree canopies where they provide homes and food for many animals while also enriching the state's plant diversity.

Partnering with colleagues from other botanical gardens, colleges, and local high schools<sup>1</sup>, NTBG has been investigating the biology and life history of these fascinating plants to better understand their ecological significance and the threats they face.

<sup>1</sup>Partners include Colorado College; Rhodes College; New York Botanical Garden; University of Connecticut; Eastern Kentucky University; and several Miami-Dade high schools.



## PLANTS AND PUPS

One of Florida's most remarkable bromeliads is the giant airplant (*Tillandsia utriculata*). As Florida's largest native bromeliad, the giant airplant can reach up to two meters. This keystone species provides essential habitat and resources for various organisms within its micro-ecosystem. By capturing small pools of water among overlapping leaf bases, giant airplants act like an aquarium with dragonfly larvae, and tadpoles. Overlapping dead leaves at the base of the plant become a natural terrarium where ants, cockroaches, and scorpions live. These microorganisms and invertebrates boost biodiversity and increase nutrient availability for the plant itself and animals that live within. It takes 15-20 years for giant airplants to reach reproductive maturity. They can produce more than 25,000 seeds in a massive, one-time only reproductive event.

Another long-lived native bromeliad is the cardinal airplant (*Tillandsia fasciculata*) which also takes a considerable amount of time to reach reproductive maturity and shares a similar distribution with the giant airplant. This species, however, is much smaller, typically growing about 70 cm in height. Another key difference between the two is that the cardinal airplant can reproduce both sexually via pollination and asexually as "pups" that form clones at the base of the plant.

## THREATENED BY THEFT, WEEDS, AND WEEVILS

Florida's remarkable bromeliads are threatened by habitat destruction, illegal collecting, and invasive species. As land development and



INSPECTING A GIANT AIRPLANT (*TILLANDSIA UTRICULATA*). PHOTO BY ALEJANDRA LIBERTAD CADENAS

urbanization claim more bromeliad habitat, their numbers continue to decline. Additionally, many of these beautiful plants are highly coveted and are being illegally poached from the wild by collectors and hobbyists.

The greatest threat imperiling Florida's larger native bromeliads is an invasive weevil that was inadvertently introduced through the horticulture trade in the 1980s. This weevil (*Metamasius callizona*) has caused a significant decline in native bromeliad populations by feeding on leaves and stems, often killing the plants before they can reproduce.

Research indicates that the giant airplant is more severely affected by the weevil than the cardinal airplant which may be able to survive an attack by producing pups. The spread of this weevil has been devastating and continues to pose a significant threat in Florida.

Hoping to mitigate these threats, our research team, in collaboration with local high schools, is considering several key questions of population, reproduction, growth, nutrients, and microbial communities that will help us better understand and protect bromeliads.

In order to learn more about bromeliad population structures and dynamics, we are studying how various environmental factors influence the distribution, demographics, and health of bromeliad populations over time. We are also examining the proportion of resources invested in reproduction and the success rates of these efforts.

Additionally, we are quantifying how bromeliads grow and use nutrients that are crucial to their

health. Our research includes an examination of the microbial communities associated with bromeliads and determining how they significantly impact health and growth.

Harnessing the skills and strengths of our diverse team, our research employs a combination of direct observation, laboratory and field studies, and mathematical, statistical, and simulation modeling. For this research, both the Kenan Lab and the facilities at the International Center for Tropical Botany at The Kampong have been invaluable.

## SCIENTIFIC FINDINGS

Among our preliminary findings, we have learned that because *Tillandsia* seeds are dispersed by wind, their success in finding



KAMPONG DIRECTOR DR. BRIAN SIDOTI. PHOTO BY ALEJANDRA LIBERTAD CADENAS





A MIAMI-DADE HIGH SCHOOL STUDENT AND HIS TEACHER MEASURING AIR PLANTS AT THE KAMPONG. PHOTO BY RODRIGO GAYA

suitable habitats depends largely on wind patterns. We found this to be true for the giant airplant at both Fairchild Tropical Botanic Garden in Miami and Myakka River State Park in Sarasota.

Our studies also included measuring different aspects of bromeliad growth and reproduction, as well as vegetative vs. reproductive mass. We compared the mass of the leaves and stems (vegetative parts) to the mass of the flowers and seeds (reproductive parts) in two bromeliads – the giant airplant and the cardinal airplant – to understand how they use their resources.

We used math and computer models to predict how giant airplant populations will change over time. We found that to keep the population stable for 100 years when the

invasive weevil is around, 13-20% of the seeds need to sprout and grow. Our research shows that the presence of the weevil appears to reduce plant reproduction size which may adversely affect plant populations.

In recent seed studies, we discovered that giant airplants produce more seeds than previously thought, while the size of each seed stays about the same. This suggests that giant airplants might produce more seeds each time it reproduces, which could affect its survival and growth in Florida, especially with the threat of weevil infestations.

By studying the growth stages and chemical processes that affect giant airplants, we better understand the need to protect bromeliads when they are most susceptible to weevil attack.

## COLLABORATIVE CONSERVATION

At NTBG, we are committed to including local high school, undergraduate, and graduate students in our research through summer internships, hands-on data collection, and interdisciplinary scientific explorations. Students at each level have conducted research at the intersection of botany, evolutionary biology, ecology, conservation, and mathematical modeling. Through these activities, students have honed their skills for data collection, analysis, and presentation.

Our collaboration with students has not only helped us gather important data, but is also inspiring the next generation of scientists. Furthermore, students are learning from each other. To cite one example, through our bromeliad research, undergraduates from Colorado College trained Florida high school students on protocols for measuring bromeliad growth and development.

Science educators are also benefiting. We've had professors offer professional development workshops to Florida's high school teachers, helping develop teacher skills by working with bromeliads. Undergraduates have coauthored publications with professional scientists and much more cross-pollination will happen in upcoming inter-institutional, interdisciplinary bromeliad research projects.

By researching Florida's native bromeliads, particularly the giant airplant, we are gaining valuable insights to the crucial role these plants play in their ecosystems. Understanding their biology and life history, as well as the threats they face, is key to their conservation.

Studying and protecting these plants need not be limited to scientists and students. Each of us can play a positive role by joining a local native plant society, volunteering, spreading awareness of the remarkable plants around us, and supporting NTBG's future research initiatives.

Through a combination of curiosity and respect for nature, collaborative research, and life-long education, we can help protect keystone species and ensure their survival for future generations. 🌿



ABOVE: A COLORADO COLLEGE BIOLOGY PROFESSOR AND TWO RESEARCH STUDENTS CONDUCTED SEED GERMINATION EXPERIMENTS. CONTRIBUTED PHOTO  
BELOW: MIAMI-DADE HIGH SCHOOL STUDENTS COUNTING SEEDS IN THE KAMPONG'S KENAN LABORATORY. PHOTO BY RODRIGO GAYA

READ AND SHARE ONLINE





# garden sprouts

News from around the Garden



CONTRIBUTED PHOTOS

## TWO MORE STAFF DEFEND PHD THESES

In June, NTBG GIS and drone program coordinator Ben Nyberg and Kahanu Garden and Preserve director Mike Opgenorth successfully defended their doctoral theses from the University of Copenhagen before a review committee at the Natural History Museum of Denmark.

Ben Nyberg's thesis was titled 'Uncharted Territory: Drone Applications in Plant Conservation.' His research focused on using drones to survey difficult-to-reach cliff environments, uncovering unknown plant populations, and documenting previously undescribed species. Ben and his collaborators have developed a new drone-based tool for collecting plant material from what had been inaccessible areas. His thesis also included analyses of the endangerment of global cliff floras, IUCN Red List assessments, and a description of the newly identified species *Schiedea waiahuluensis*. As environmental pressures increase, drone technology is emerging as a valuable tool for efficient and effective conservation, facilitating the protection of rare and endangered species in extreme cliff habitat.

Four days after Ben's PhD defense, Mike Opgenorth also defended his doctoral thesis with research focused on conservation horticulture using nānū (Hawaiian gardenia) as a case study in how a holistic approach can be used to investigate factors that may lead to improved cultivation and understanding.

Mike's ethnobotanical investigation of nānū came with recommendations for a biocultural approach to conservation followed by a genetic study of *Gardenia remyi* to learn how the dynamics between plants on different islands and within islands can guide future programs for cross pollination of plants in cultivation or in the forest. As a case study, Mike examined outplanting successes and challenges in Limahuli Valley, investigated the effect of mycorrhizae on nānū health, and conducted experiments to gain better understanding of seed behavior. Mike's thesis concluded with an examination of the status of horticultural research in the United States, complete with recommendations.

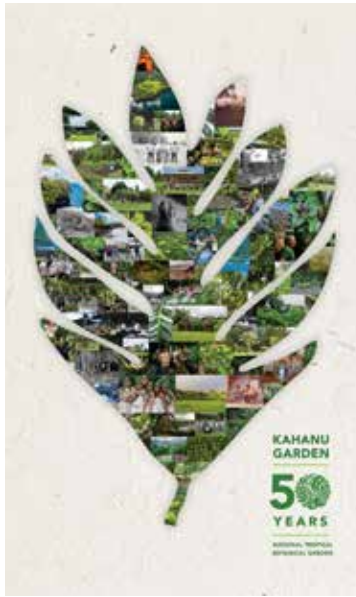
Helping celebrate Ben and Mike's successful defenses in Copenhagen were friends, family, NTBG CEO and president Janet Mayfield, and Dr. Nina Rønsted, acting museum director and professor at the University of Copenhagen's Natural History Museum of Denmark, who served as their academic supervisor. Congratulations Dr. Nyberg and Dr. Opgenorth!

## KAHANU GARDEN MARKS 50 YEARS

As NTBG celebrates its 60th anniversary this year, Kahanu Garden marks its 50th. Established with a 60-acre gift of land from the Kahanu-Matsuda family and Hāna Ranch in east Maui in 1972, Kahanu Garden officially became part of what was then called Pacific Tropical Botanical Garden (now NTBG) in 1974. Kahanu Garden began with a monumental task – to recover, restore, and steward Pi'ilanihale Heiau, a National Historical Landmark and Hawai'i's largest ancient cultural site. Today, Pi'ilanihale Heiau continues to be recognized and revered for its important role in perpetuating Hawaiian culture.

From its humble beginnings, over fifty years Kahanu Garden has evolved into a refuge for culturally and ecologically significant plants from Hawai'i and across the Pacific. These include extensive collections of mai'a (bananas), kō (sugar cane), niu (coconut palms), 'uala (sweet potatoes), and other Hawaiian heritage crops as well as many rare and critically endangered native plants, many endemic to Hawai'i or a single island. Kahanu Garden is also home to the first and largest conservation collection of 'ulu trees at the center of NTBG's Breadfruit Institute, established in 2003. Today the institute manages the largest and most diverse breadfruit collection in the world. In 2016, the Kahanu Preserve was established, in part, to preserve a dwindling number of Maui's coastal hala (*Pandanus*) forests.

Over the last half century Kahanu Garden and Preserve has become an integral part of Hāna and the east Maui community as a vital place of culture and education, sustainability and food security, as well as a place of reverence, tranquility, and beauty. Building on fifty years of commitment and hard work, Kahanu Garden and Preserve continues to grow and evolve, celebrated for perpetuating connections to the past, treasured as a place to gather, grow, and learn today, and valued as a model for the future.



## NTBG WELCOMES NEW DEPARTMENT HEADS

In August, NTBG welcomed two new leaders to its Science and Conservation and Philanthropy teams. Dr. Tiffany Knight is NTBG's new director of science and conservation. Natalie King is the new director of philanthropy.

Dr. Knight received her PhD from the University of Pittsburgh in 2003, where she studied plant population ecology. After two postdoctoral appointments, she served as an associate professor

at Washington University in St. Louis and a research associate at Missouri Botanical Garden where she studied in situ conservation of endangered plant populations. In 2014, Dr. Knight relocated to Leipzig, Germany where she was co-director of the German Centre for Integrative Biodiversity Research, shifting her research towards community ecology and macroecology.

In 2024, with a strong desire to return to applied plant conservation research, and inspired by NTBG's mission, Dr. Knight joined NTBG in August as director of science and conservation. She is excited to lead a highly accomplished team and work with the NTBG community to contribute to a sustainable future for plants and people. Dr. Knight relocated to Kaua'i with her son Jack, 14, an avid bird watcher, and daughter Christina, 11, a beach lover and soon-to-be novice surfer. Grateful for the opportunity and trust placed in her, and overwhelmed by a warm welcome, Dr. Knight is eager to learn about Hawaiian culture and history, while contributing locally, and forging new relationships with people and place.

Also in August, NTBG welcomed Natalie King as director of philanthropy, succeeding Heather George who will continue as NTBG's donor relations specialist. Natalie brings over a dozen years of expertise in philanthropy with an educational foundation in journalism, cultural anthropology, and museum studies. Natalie's passion for biodiversity and biocultural conservation was cultivated growing up on O'ahu where her deep-rooted connections to nature and community shaped her approach to philanthropy. Before joining NTBG, Natalie was the senior director of individual giving at Shedd Aquarium where she enjoyed working with members, donors, and volunteers to grow Shedd's philanthropic support ahead of its 100th anniversary.

Natalie's data-driven strategies and commitment to relationship-building were pivotal in advancing the organization's goals. Prior to her tenure at Shedd, Natalie led philanthropic programs at the Girl Scouts of Greater Chicago and Northwest Indiana, the Smart Museum at the University of Chicago, and the Alpha Phi Foundation. In her free time, Natalie enjoys cooking, traveling, and spending time on the water with her husband and dog. She is excited to help further advance NTBG's mission and build connections with steadfast supporters.

garden sprouts



KANALOA KAHOOLAWENSIS

# wish list

Make a difference today! Your purchased Wish List item will directly meet immediate program needs. Donate online at [ntbg.org/support/donate](https://ntbg.org/support/donate) or call Chelsey Aki at (808) 332-7324 Ext. 209. Mahalo for your support!

## BREADFRUIT INSTITUTE

Horticultural supplies for ROBA - \$500

## KAHANU GARDEN

(4) Metal gas cans - \$400

## LIMAHULI GARDEN

(4) Storage shelves - \$1,000

## ALLERTON/MCBRYDE/NURSERY

Hedge Trimmer for Allerton Garden - \$500

Tiller for McBryde Garden - \$750

Washing machine for the Nursery - \$800

## SCIENCE AND LIVING COLLECTIONS

Horticultural supplies - \$500

Label printer - \$500

## SOUTH SHORE GARDEN

Air excavator - \$2,000

(4) Patio umbrellas - \$1,200

## THE KAMPONG GARDEN

Bench tables for Nursery - \$1,000

## VOLUNTEER PROGRAM

Lanyards - \$150

To see the complete Wish List, please visit: <https://ntbg.org/support/wishlist/>



# an eye on plants

SELECT SPECIES IN FOCUS

## Kōlea (*Myrsine cirrhosa*)

Autumn is a transitional season, a bridge between summer and winter, and for NTBG and our collaborators, it is also a season to celebrate as new plant species are being discovered on Kauaʻi.

In the first half of 2024, NTBG scientists and colleagues have published descriptions of three previously unknown species which are believed to only grow on Kauaʻi: haʻiwale (*Cyrtandra obliquifolia*, Gesneriaceae), naʻenaʻe (*Dubautia haupuensis*, Asteraceae), and kōlea (*Myrsine cirrhosa*, Primulaceae). The kōlea was published in the peer-reviewed journal PhytoKeys by NTBG's senior research botanist Dr. David Lorence, senior research biologist Kenneth Wood, along with co-authors Dr. Marc Appelhans (University of Göttingen) and Dr. Warren Wagner (Smithsonian Institution).

Descriptions of two additional species (one of which was discovered by NTBG using a drone) are expected to be published before the end of the year.

The discovery of these plants underscores the rich diversity of the Hawaiian flora which includes 19 species of kōlea (*Myrsine*) – 12 of which are endemic to Kauaʻi. As for the other two new discoveries, there are currently 38 species or subspecies of naʻenaʻe (*Dubautia*) with 18 on Kauaʻi, and 62 species of haʻiwale (*Cyrtandra*) in Hawaiʻi. On Kauaʻi alone, there are 14 species, all but one of which is endemic. It's noteworthy that the above newly described species are single-island endemics. That is, they occur naturally on Kauaʻi and nowhere else.

Ken Wood, part of the NTBG Science team who discovered the new kōlea, explains that it is known from several small colonies of approximately 45 individuals where it grows in montane bogs and along windy ridges at an elevation up to 5,000 feet. A preliminary conservation assessment indicates that *Myrsine cirrhosa* is considered Critically Endangered.

This new kōlea grows as a three to six foot-high shrub and is noted for its orange to reddish-brown tinged bark. Kōlea has creamy yellow star-shaped flowers streaked with maroon inside the petals. Its long, thin green leaves appear to undulate like waves ending in a curly tendril-shaped tip called a cirrhose apex for which the species is named.

There are some 200 species of *Myrsine* growing as trees and shrubs distributed across Africa, Asia, and the Pacific. Hawaiʻi's 19 *Myrsine* species are believed to be insect pollinated, their seeds spread by birds.

Like many native Hawaiian plants, kōlea is threatened by feral pigs, goats, black-tailed deer as well as invasive non-native plants, slugs and rats. With so few individual plants left growing near Kauaʻi's highest peak and one of the wettest spots on Earth, landslides triggered by heavy downpours are also potentially devastating for its survival.

Growing in remote forested ridges and slopes alongside native sedges, grasses, and ferns, *Myrsine cirrhosa*, Hawaiʻi's newly described kōlea and the other newly discovered species grow far from the gaze of humanity but each serves as an important reminder that there are still unknown species and conservation remains a vital pursuit.

Reflecting on this year's cluster of newly published species, Ken says, "Kauaʻi is premier in plant diversity, now exceeding more than 250 single island endemics. Every one of them is profoundly relevant after evolving for millions of years. Each newly discovered species is another reason to support conservation efforts aimed at protecting them from extinction."

At a time of increasing concern about the Earth's changing climate, habitat loss, and declining biodiversity, the discovery of new forms of plant life is that much more meaningful and a cause for celebration.



KŌLEA (*MYRSINE CIRRHOSA*) PHOTO BY KEN WOOD





## National Tropical Botanical Garden

3530 Papalina Road  
Kalāheo, Hawai'i 96741 USA



LIMAHULI GARDEN AND PRESERVE STAFF BRENDAN STOGNER (LEFT) AND RANDY UMETSU COLLECTING OLONĀ SEEDS AND CUTTINGS ON KAUA'I'S NORTH SHORE. READ MORE ON PAGE 6. PHOTO BY EZIKIO QUINTANA