

Vol. XXXVI No. 1

WINTER-SPRING 2020

# the bulletin

of the National Tropical Botanical Garden





# Conservation is up to us...

Through our new *Plant Conservation Fund*, we are seeking to match a generous contribution of \$100,000, which will be used directly to protect endangered plants through exploration, discovery, and research. These funds will enable NTBG scientists to continue their work throughout tropical regions. Please visit [ntbg.org/donate](http://ntbg.org/donate) or use the enclosed envelope to make your contribution, and indicate "Plant Conservation Fund."



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### ON THE COVER

*Oparanthus hivoanus* is a woody member of the Asteraceae (daisy family) endemic to cloud forests and wet montane shrublands of Hiva Oa island in the Marquesas Islands. NTBG is publishing the Flora of the Marquesas Islands this year. Photo by Ken Wood.

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).

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## OUR MISSION

To enrich life through discovery, scientific research, conservation, and education by perpetuating the survival of plants, ecosystems, and cultural knowledge of tropical regions.

The National Tropical Botanical Garden was chartered by an Act of United States Congress in 1964. The objectives of the institution were set forth in the Charter:

- to establish, develop, operate and maintain an educational and scientific center, with libraries, herbaria, laboratories, and museums...to encourage and conduct research in basic and applied botany;
- to foster and encourage fundamental research in tropical plant life and study the uses of tropical flora in agriculture, forestry, horticulture, medicine, and other sciences;
- to share knowledge acquired relative to basic and applied tropical botany through publications and other media;
- to collect and cultivate tropical flora and to preserve for the people of the United States species of tropical plant life threatened with extinction;
- to provide a facility which contributes to the education, instruction, and recreation of the people of the United States.



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

## Message from Janet Mayfield

As we enter a new decade, I feel as if time is moving ever faster. Nowhere is this truer than in the natural world. For many of us, 2020 began watching in disbelief as wildfires razed Australia, scorching over 10 million hectares, an area the size of Iceland, destroying whole ecosystems and threatening endemic species with extinction.

With accelerating glacial and arctic ice melt, worsening degradation of soil, water, and air, and record-smashing floods, tropical storms, and wildfires, the biodiversity of our planet, and our own existence is called into question.

These threats also raise practical questions for me as leader of the National Tropical Botanical Garden. What is NTBG's role in this time of crisis? What can we do? What must we do?

First, I believe we must remain hopeful. NTBG is based on a remarkable network of staff, volunteers, members, and a dedicated Board of Trustees and Fellows who have proven their steadfast commitment to our root cause: saving plants.

Second, we must stay focused. NTBG has a 56-year-old mandate based on our Congressional charter that calls for our organization to "enrich life through discovery, scientific research, conservation, and education by perpetuating the survival of plants, ecosystems, and cultural knowledge of tropical regions." Our charge is clear and that will not change. The serious state of our planet only makes our work that much more urgent.

Third, we need to take advantage of new tools and technology, and the growing recognition by the public, media, and government that our work is indispensable. In 2019, NTBG gained international recognition for our conservation work using drones to rediscover a species that was believed to have gone extinct. That work continues and has entered a new phase as we collaborate with international partners to develop a way to use drones for seed collection.

Increasingly, I see rigorous news coverage of issues related to the importance of saving biodiversity, wildlife conservation, and environmental matters as a whole. This spring NTBG will offer its Environmental Journalism Program for its 18th year, educating media professionals who can amplify the importance of saving plants to a global audience.

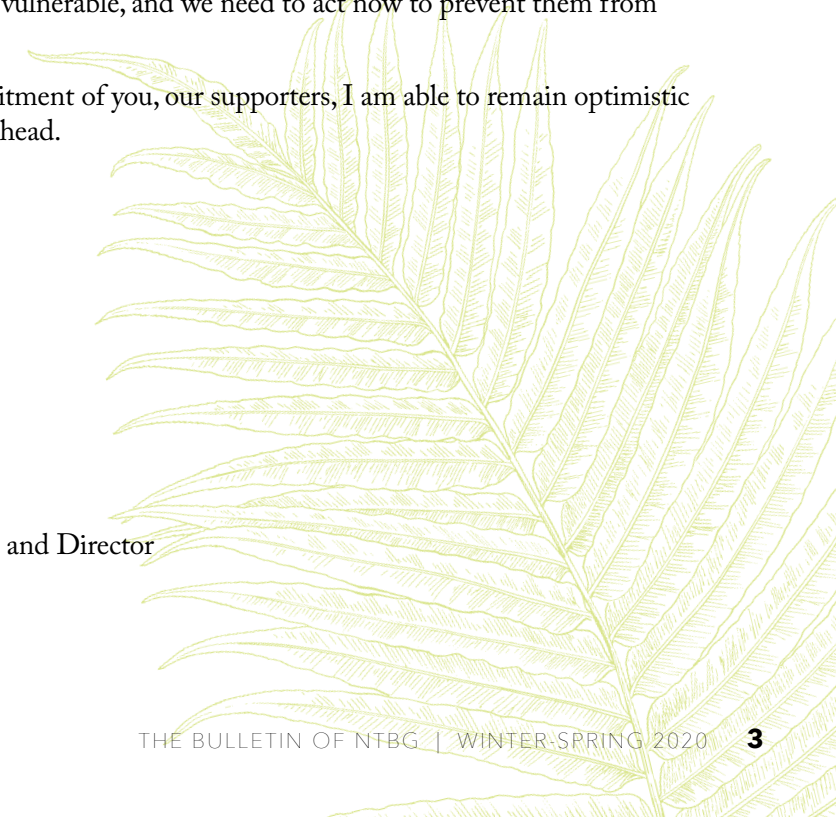
Finally, I am heartened to see members of Congress introduce legislation like the "Extinction Prevention Act of 2019." That bill includes the "Pacific Islands Plant Conservation Fund Act of 2019" whose purpose is to assist in the conservation of threatened and endangered plant species. In support of this bill, Senator Mazie Hirono said, "Hawai'i is home to over 350 federally listed threatened and endangered plant species, the most of any state. The growing threat posed by climate change means these plants are especially vulnerable, and we need to act now to prevent them from disappearing forever."

With a committed and able team and the steadfast commitment of you, our supporters, I am able to remain optimistic and energized as NTBG moves forward into the decade ahead.

Thank you for your support and partnership.



Janet Mayfield  
Chief Executive Officer and Director



# 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 \$75 to \$500 with a level to fit everyone from individuals to families. **Contact: [members@ntbg.org](mailto:members@ntbg.org)**

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# wish list

Would you like to make a difference today? Purchase an item from our wish list and your donation will go directly to meet immediate program needs. Please send your contribution with the enclosed envelope, including a specific description of the item. If you have any questions or would like to make your donation by phone, call Chelsey Aki at (808) 332-7324 Ext. 209. To make your donation online, go to [ntbg.org/support/donate](https://ntbg.org/support/donate). Mahalo for your support!

## LIMAHULI GARDEN

Two windshield covers for ATV - \$1,300

## MCBRYDE GARDEN AND ALLERTON GARDEN

Two Stihl String Trimmer - \$1,000

Cover crop seeds - \$250

RotoTiller - \$650

## TOUR AND VISITOR CENTER PROGRAM

Back up cameras for buses - \$500

Speakers for Visitor Center Shop - \$250

Kids Interpretative materials - \$750

## KAHANU GARDEN

Waste containers - \$300

Work boots - \$1,000

Stihl Chainsaw - \$800

## THE KAMPONG

Portable radios - \$1,500

Omnidirectional internet speaker and microphone - \$150

Cell phone service for Horticulturist - \$1,300

Cordless telephone system - \$250

## SCIENCE & CONSERVATION AND LIVING COLLECTIONS PROGRAMS

Seven flights to Big Island to reassess and collect plants - \$1,400

Two helicopter flight to survey and collect Olona - \$1,500

## BREADFRUIT INSTITUTE

Airfare to Kahanu Garden - \$350

Dehumidifier - \$250

Work boots - \$360

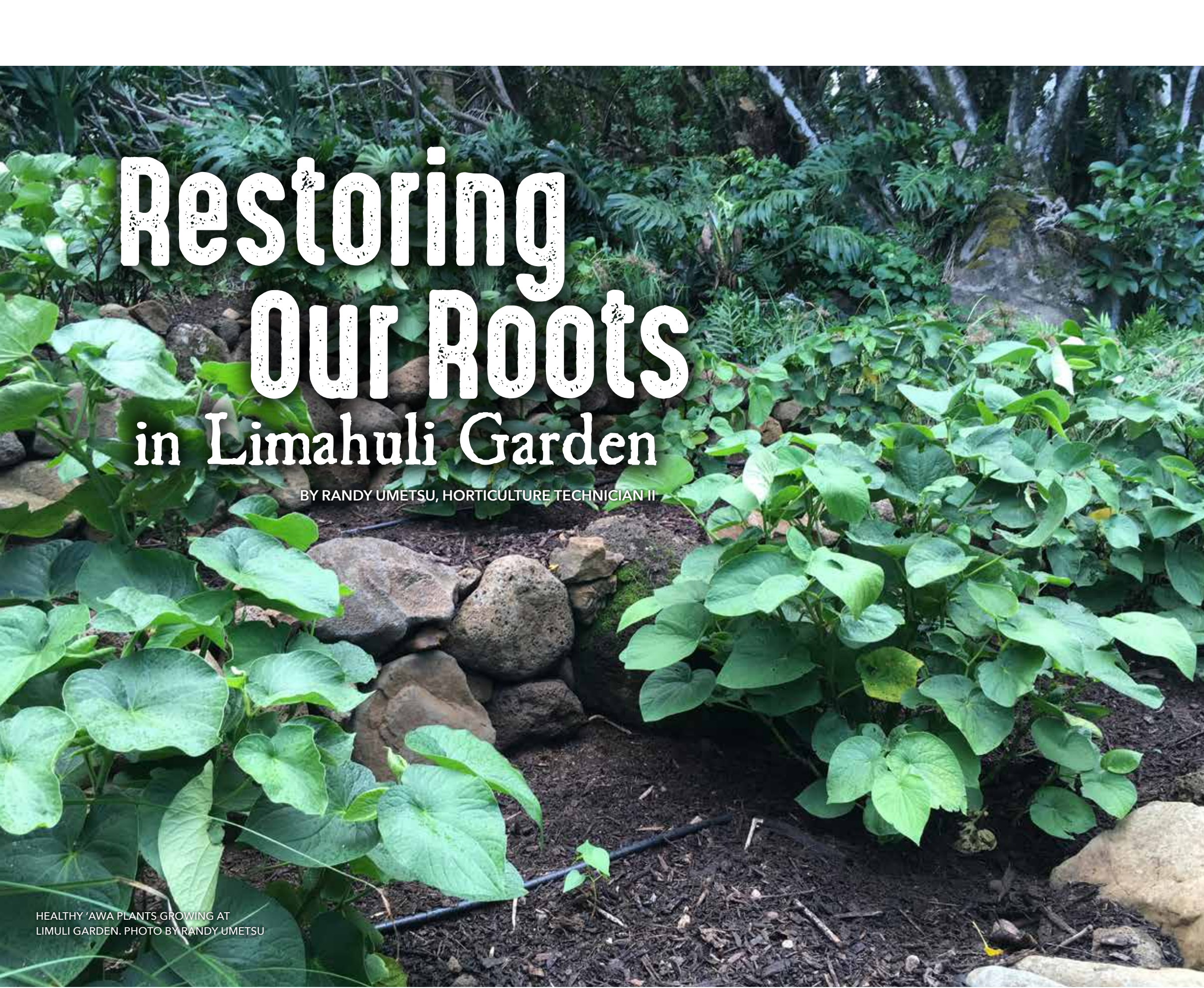
## VOLUNTEER PROGRAM

Utility tubs - \$120

Garden Tools - \$200

Folding step stools - \$40

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



# Restoring Our Roots in Limahuli Garden

BY RANDY UMETSU, HORTICULTURE TECHNICIAN II

HEALTHY 'AWA PLANTS GROWING AT  
LIMULI GARDEN. PHOTO BY RANDY UMETSU



Following historic flooding on Kaua'i's north shore in April 2018, public access to the remote communities of Wainiha and Hā'ena was restricted for over a year as Hawai'i's Department of Transportation undertook major construction work to stabilize the cliffs and steep hillsides leading to the area. The road closure meant that Limahuli Garden was all but inaccessible to the general public. For Limahuli staff, we saw this as a perfect opportunity to not only rebuild the garden infrastructure to be more resilient to future storms, but also as a chance to complete "dream projects" that were never possible while the garden was open to visitors.

For weeks on end, often in difficult, wet, muddy conditions, we toiled to restore Limahuli Garden. After many hard days clearing debris, rebuilding paths, and fortifying the garden, our crew ended the day by preparing a bowl of 'awa, a traditional beverage enjoyed for centuries in Hawai'i. Known in other parts of the Pacific as kava, yagona, sakau, and other names, 'awa is traditionally prepared using the plant's roots which are chewed and then squeezed into water to make a beverage that is shared communally.

Since the time of the earliest Hawaiians, 'awa has been used medicinally, ceremonially, and socially. The early Polynesian settlers carried 'awa plants (*Piper methysticum*) when they discovered the Hawaiian Islands, along with other life-sustaining plants such as kalo (*Colocasia esculenta*) and 'uala (*Ipomoea batatas*), which are among those known collectively as canoe plants.

Enjoying ‘awa together after a hard day of work was a way to relax our muscles as we talked about the flood, the road closure, and the many changes in the garden. During those uncertain, often trying times, ‘awa was an elixir that sustained us physically and mentally.

We currently cultivate about ten Hawaiian varieties of ‘awa in our living collection including ‘Opihikao, Honokāne Iki, Mahakea, Hiwa, Nēnē, Hanakāpī‘ai, Pana‘ewa, Papa ‘Ele‘ele Pu‘upu‘u, and Kūmakua. It is our hope that we can contribute to biocultural conservation by eventually curating a collection of all known varieties of Hawaiian ‘awa.

Although ‘awa cultivation and consumption in Hawai‘i declined sharply after European contact, it has recently seen a resurgence. Among our Limahuli crew, ‘awa plays an important role as our pau hana (after work) drink of choice. The time we spent communing around the ‘awa bowl helped keep our team strong through this period of great hardship the garden and community experienced after the 2018 flooding.



NEWLY BUILT LAVA ROCK TERRACES.  
PHOTO BY RANDY UMETSU

As the months passed, we made great progress in our recovery efforts, but just ten months later, in February 2019, a powerful winter storm with destructive winds and hurricane-strength gusts swept across Kaua‘i, wreaking havoc in Limahuli Garden.

Among the many precious trees felled was a stately milo (*Thespesia populnea*) that had stood on the path behind our hale, a traditional thatched-roof Hawaiian house. Though we had cleared back some of the invasive Schefflera trees in this area prior to the storm, the loss of this milo tree left us with a big, empty space along the pathway that just begged to be filled with new plants.

‘Awa requires ample space, good drainage, just the right combination of sunlight and shade, and protection from the wind to grow optimally. We had already thought of planting ‘awa in this area because it met these requirements, and now the unexpected loss of the milo tree provided an opportunity to fill this space. Noah Ka‘aumoana, Mālama ‘Āina<sup>1</sup> Specialist and master wall builder, saw the empty slope and had the ambitious idea to build terraces for our ‘awa plants.

After making our plans, we built the walls over the course of a few days with the help of volunteer high school students and the Kupu service learning program. Passing the rocks from person to person, we hauled each stone up the hill and set them in place by hand, truly embodying the Hawaiian virtue of laulima, or working together with the help of many hands. In the end, we built five levels of terraces and planted about 20 ‘awa plants, tripling the number in our collection. In front of the terraces we planted ‘ahu‘awa (*Cyperus javanicus*), a sedge commonly associated with ‘awa as the fibers are used to strain ‘awa.

We do not currently feature our newly planted hill of ‘awa with its beautiful terracing on the self-guided tour, so the plantings remain invisible to most garden visitors, but I proudly tell the story of building the ‘awa terraces to all the groups I have guided through the garden because it symbolizes regrowth after the storm while honoring our precious ‘awa collection with a space of its own. What’s more, these are the only agricultural walls built in Limahuli Garden in modern times, all others having been built for retaining purposes.

<sup>1</sup>Mālama ‘Āina means to ‘care for the land’



LAULIMA (WORKING TOGETHER) AT LIMAHULI GARDEN.  
PHOTO BY KATIE CHAMPLIN

Today most of the ‘awa we drink is imported from other Pacific nations in a powdered form, and only on very special occasions can we drink fresh Hawaiian ‘awa root as it takes several years from planting to harvest. In a few years, I hope we can gather our precious ‘awa plants and continue our story of regrowth from disaster with even more plantings in our ‘awa terraces.

By growing, harvesting, and sharing the plant in a culturally appropriate manner, we’ve been able to perpetuate plant knowledge, honor Hawaiian culture, and contribute to the diversity of our living collections. 🌿

# 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 redoubled efforts to assess the more than 1,300 native plant taxa in Hawai‘i. To date, over 500 (approximately 40 percent) have been assessed, reviewed, and published on the Red List, adding to the more than 35,000 plant taxa published on the Red List worldwide.

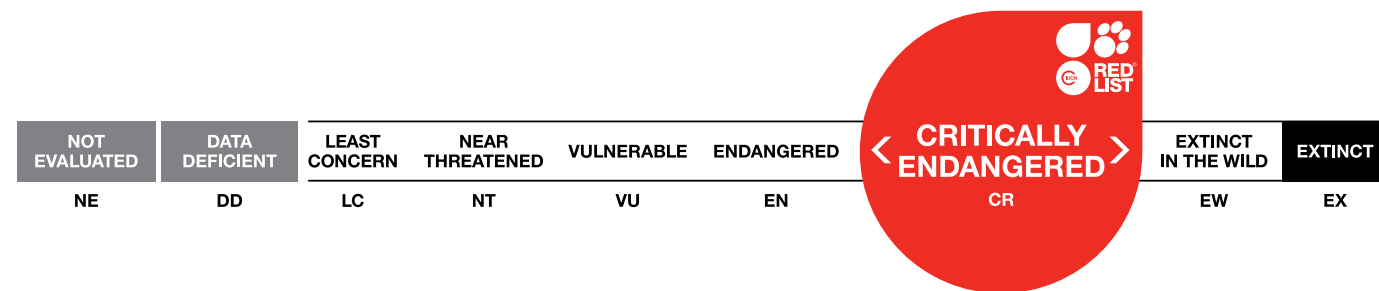


PHOTO BY KEN WOOD

## Species: *Euphorbia eleanoriae* (Euphorbiaceae)

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

*Euphorbia eleanoriae* is a Kaua‘i single-island endemic small shrub that occurs on exposed windswept ridges and cliffs adjacent to mesic forests. An estimated 261 individuals among three subpopulations remain. The subpopulation in Limahuli Valley was discovered by NTBG using drone technology in 2017. Persistent threats to *E. eleanoriae* include predation and habitat degradation by non-native animals and competition by non-native invasive plant species. NTBG staff partners with the Plant Extinction Prevention (PEP) Program to monitor populations and continue efforts to make seed collections.

The assessment of *E. eleanoriae* was completed during a three-day campaign led by NTBG in January 2020. We completed assessments for 23 additional Kaua‘i endemic plant taxa, which will be published on the Red List before the IUCN World Conservation Congress convenes in June. NTBG will be prioritizing the completion of assessments for the 200+ Kaua‘i single-island endemic vascular plant taxa (angiosperms and ferns) before the end of this year. Red listing is an important way of highlighting the uniqueness of the Hawaiian flora and the urgent need to protect it. – *Seana Walsh*



PHOTO BY JON LETMAN



## the green thumb

### PLANT THE FUTURE WITH US!

Support the National Tropical Botanical Garden with your gift today.

Plants provide our food, our shelter, and the air we breathe. Your gift can help ensure the survival of the Earth’s most endangered tropical plants and the people and animals that depend on them.

Thank you for your support!

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Please contact us if you have questions at [donations@ntbg.org](mailto:donations@ntbg.org) or call 808.332.7324 ext. 212



Deciduous plants lose their leaves and go physiologically “dormant” when environmental conditions are not favorable for optimal growth, typically triggered by a decrease of temperatures and photoperiod for temperate climate plants and drought conditions for tropical climate plants.

Dormancy allows the plant to conserve resources during times of stress and provides benefits for the gardener as well. Leaf litter brings nutrients from deep in the ground to the soil surface, increasing organic matter and feeding soil invertebrates and microorganisms (this is assuming you don’t rake the leaves away!). Dormant plants also provide a respite from foliar disease and pest pressure. In addition, fallen litter provides winter shelter for many beneficial insects such as native bees. Note: remove any diseased or pest-laden litter to minimize the potential spread to new growth.

Those new to gardening may have a difficult time distinguishing dormant plants from dead or dying plants. Here are a few things to look for:

- Dormant plants typically have pliable stems, if you gently bend a stem and it breaks or is shriveled or mushy it is likely dead.
- Using your fingernail, carefully scratch the stem to expose the cambium layer (the vascular system of a plant, directly under the stem surface), live plants will be slightly green.
- If the plant loses its leaves outside of its typical dormancy period it is likely due to a biotic or an abiotic disorder.

#### What to do with dormant plants:

- Reduce watering. Dormant plants do not have leaves to transpire and therefore require much less water. Overwatering can lead to root rot and plant mortality.
- For some plants, such as stone fruit trees (apricots, plums, peaches etc.), the ideal time to prune is during the dormancy period (wait until after the last chance of frost).
- Apply a layer of organic mulch around plants.

—*Alex Lehman, Horticulture Manager, South Shore Gardens*

THREE DECADES IN THE WORKS,

# The flora of the Marquesas is complete

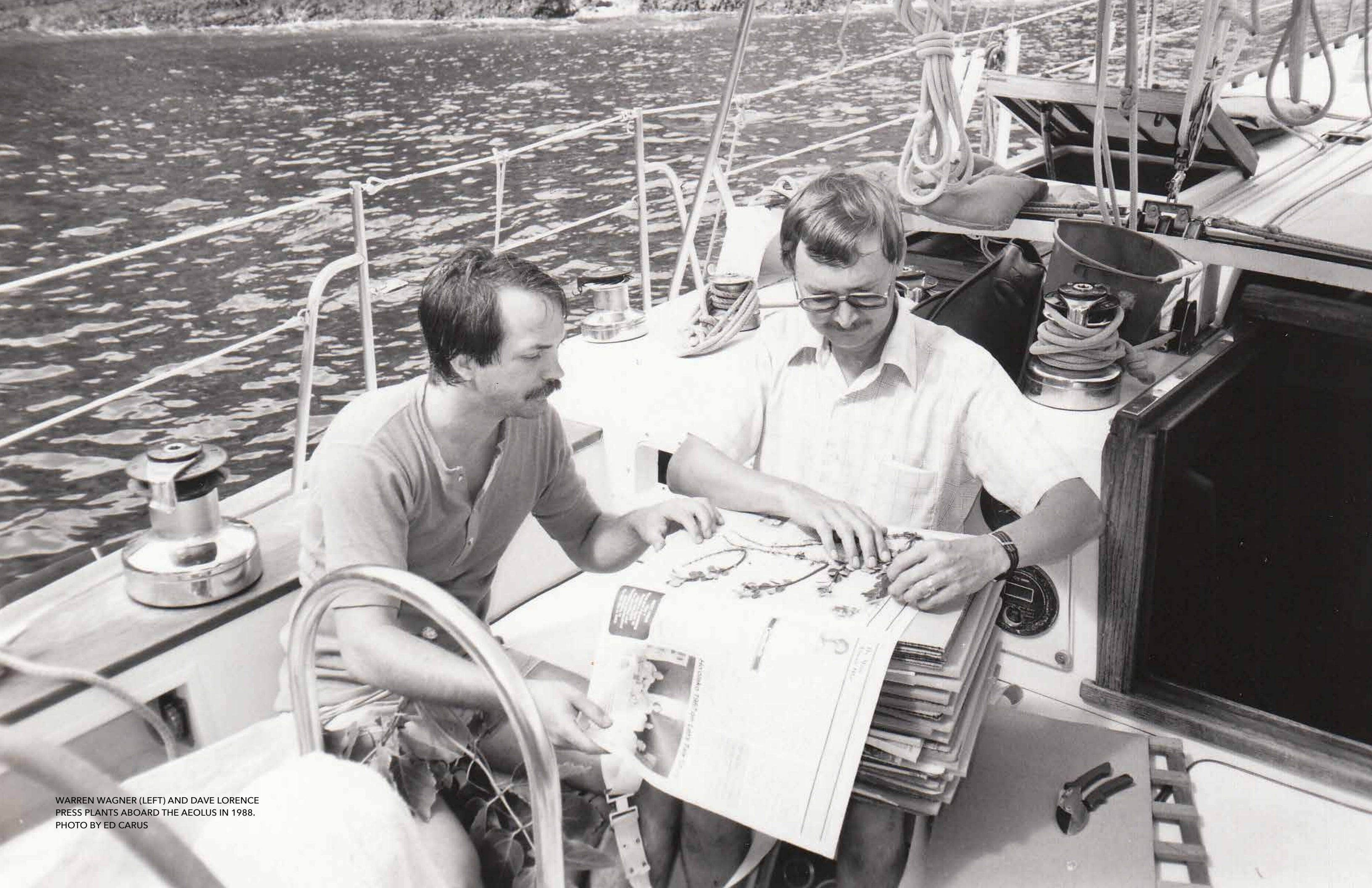
BY DR. DAVID H. LORENCE,  
SENIOR RESEARCH BOTANIST

Standing on the deck of the freighter Aranui, in the distance we could make out the spectacular rock formations that defined Fatu Hiva, southernmost of the Marquesas Islands. It was July 1988 when fellow botanist Warren Wagner and I had flown from Hawai'i to what is also known as French Polynesia where we were to rendezvous with other members of the Fatu Hiva Expedition who had traveled to the Marquesas by yacht from Honolulu.

Anchored offshore Omoa village, the smell of rancid copra wafted up from the hold below, increasing our impatience to return to terra firma. From the freighter, a dozen passengers, Warren, and I were ferried ashore in a Boston Whaler which, regrettably, capsized when the first mate miscalculated the surf break.

Miraculously, no one was injured when we were unceremoniously catapulted into the breaking surf along with the cargo. Struggling ashore, I helped an elderly woman make her way to the beach across the slippery rocks underfoot. Utterly soaked and dripping, this was my introduction to Fatu Hiva and the Marquesas.





WARREN WAGNER (LEFT) AND DAVE LORENCE  
PRESS PLANTS ABOARD THE AEOLUS IN 1988.  
PHOTO BY ED CARUS



CRANFILLIA VULCANICA



SPHAEROPTERIS FEANI



LEBRONNESIA KOKIOIDES

PHOTOS BY KEN WOOD

Among the most isolated islands in the southeast Pacific, the Marquesas are a volcanic archipelago of 12 islands, numerous islets, and exposed rocks situated in the Polynesia-Micronesia biodiversity hotspot, at the epicenter of the current global extinction crisis. Some 2,400 miles southeast of Hawai'i, the Marquesas total just over 400 square miles, around 20 percent smaller than the island of Kaua'i. Nuku Hiva, the largest island, is just 50 sq. miles with the many islands much smaller.

The relatively young islands (760,000 – 5.5 million years old) have a breathtaking elevation range from the lowest islands which are barely above the breaking waves to Hiva Oa which soars to just over 4,000 feet.

The Marquesan flora displays a remarkably high degree of endemism despite the islands' small size. Nevertheless, human colonization and the introduction of non-native animals and invasive plants over the years have severely impacted the low-to-mid-elevation vegetation of the Marquesas.

### FAMOUS ISOLATION

Scattered like green jewels across a remote swath of the South Pacific and seemingly far from the trappings of modern society, the Marquesas have long been a source

of fascination for outsiders. As a result, these islands have attracted a variety of solitude-seeking souls looking to connect with nature, or perhaps a Polynesian culture free from Western influence.

Notably, French painter Paul Gauguin and Belgian singer Jacques Brel both spent the last years of their lives in the Marquesas and were both buried in the cemetery at Atuona, Hiva Oa. The islands have also attracted famous writers and explorers such as Robert Louis Stevenson, Herman Melville, Jack London, and Norwegian ethnographer Thor Heyerdahl who wrote a book called Fatu Hiva during his year-long sojourn on the island where he and his young bride attempted (unsuccessfully) to live off the land.

Today the Marquesas are reliably connected to the outside world by satellite dishes and mobile phones. There are airports on four of the main islands, although boat travel is required to reach the others. Nevertheless, many Marquesans today still maintain strong connections to the sea and land, subsisting by fishing, hunting, and growing much of their food in agroforests and plantations, as well as selling copra and, more recently, noni (*Morinda citrifolia* L.) which has become popular as a nutraceutical.



APETAHIA LONGISTIGMATA



PSIDIUM GUAJAVA



JEAN-YVES MEYER IN THE FIELD.

PHOTOS BY KEN WOOD



NTBG'S STEVE PERLMAN (LEFT) AND KEN WOOD BOTANIZING ON FATU HIVA IN THE MARQUESAS. PHOTO BY JEAN-YVES MEYER

Warren Wagner and I became acquainted while we were Ph.D. students at Washington University in St. Louis, Missouri. By 1988 we had both assumed new research positions. I'd accepted a job at the National (then Pacific) Tropical Botanical Garden and Warren at the Smithsonian Institution (previously at the Bernice P. Bishop Museum). We quickly developed a desire to collaborate and develop interactions between our respective institutions. As we contemplated meaningful ways to collaborate, one logical project was to co-author a flora of the Marquesas because of the years of previous work by Smithsonian researchers F. Raymond Fosberg and Marie-Hélène Sachtet in the Marquesas, and the focus on Pacific archipelagoes by NTBG. Furthermore, the Marquesas had no modern flora, only an outdated and incomplete work covering southeast Polynesia published in the 1930s.

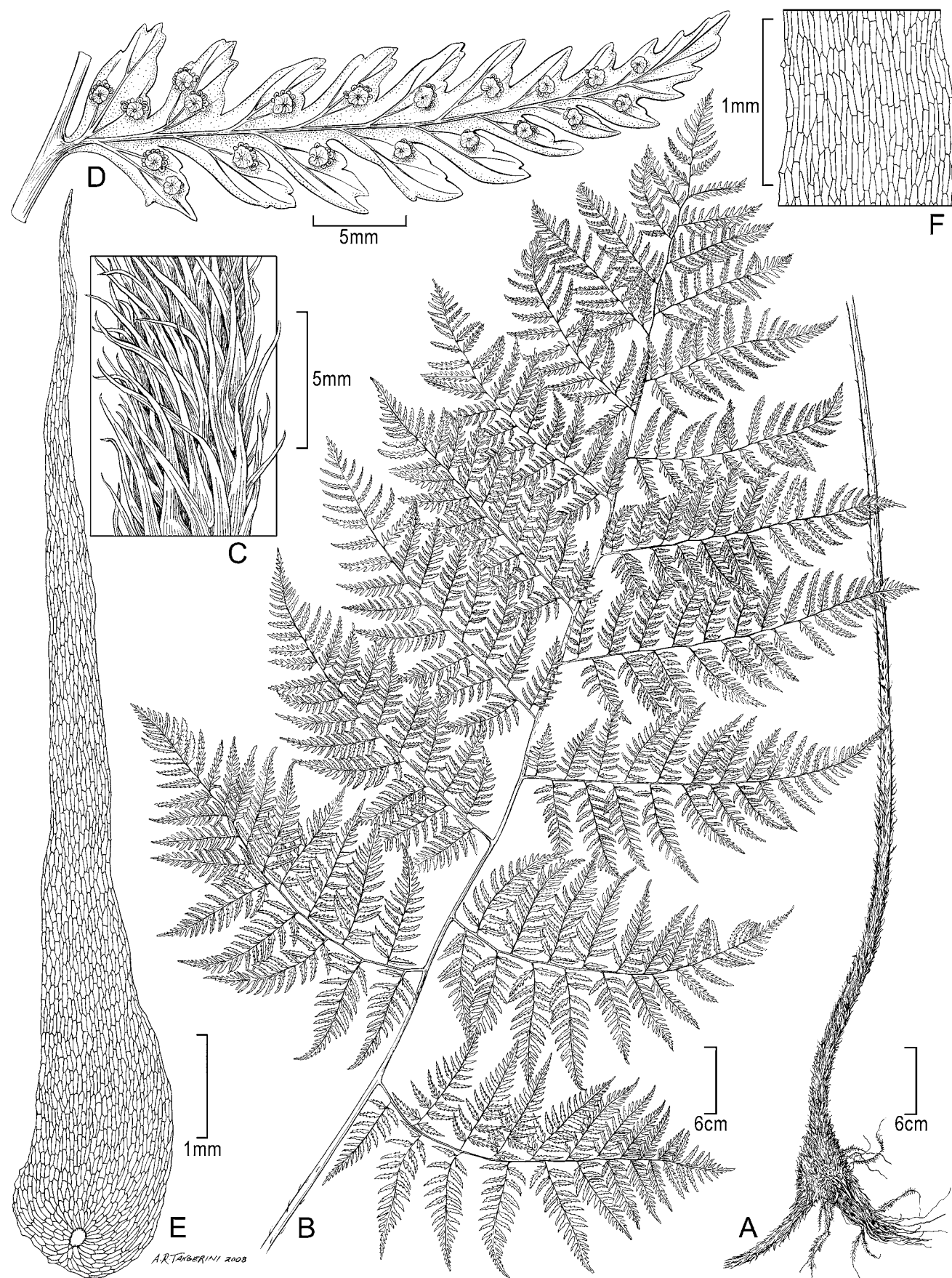
### A TOAST AND A HANDSHAKE

The Marquesas flora project was initiated informally on Kaua'i in 1988 over drinks during a meeting between Dr. Peter H. Raven, Director of the Missouri Botanical Garden, who received the Robert Allerton Award that year, and us. Peter concurred that it would be an excellent collaborative project between the two institutions and so, with a toast and handshakes the NTBG-Smithsonian Institute's Flora of the Marquesas project was born.

Over the course of the 1988 Fatu Hiva expedition and eight subsequent trips between 1995 and 2017, our fieldwork yielded important observations and the collection of at least 85 previously undescribed species. Throughout the project, we worked with collaborators from around the world. Two key participants were NTBG's Steve Perلمان and Ken Wood who joined most of the field trips, maximizing their skills botanizing in rough terrain.

The Flora of the Marquesas Islands has been a collaborative project between the National Tropical Botanical Garden, the Smithsonian Institution, and the Délégation à la Recherche de la Polynésie française intended to further knowledge of the flora of this remote archipelago. The project was supported by a generous, private donation from NTBG Trustee Cyrus B. Sweet, III and NTBG Fellow Barbara K. Sweet. The contributions by Warren Wagner were supported by the Smithsonian Research Opportunities Fund and/or NTBG through an appointment as McBryde Chair, and I gratefully acknowledge support from NTBG while serving as the B. Evans Botanist and Director of Science and Conservation.

During the 1988 and 1997 expeditions, inter-island transportation was provided by Edward H. Carus Jr., owner and captain of the 40-foot sailing vessel Aeolus, from Honolulu. We extend our sincere thanks to the many individuals and institutions in French Polynesia that

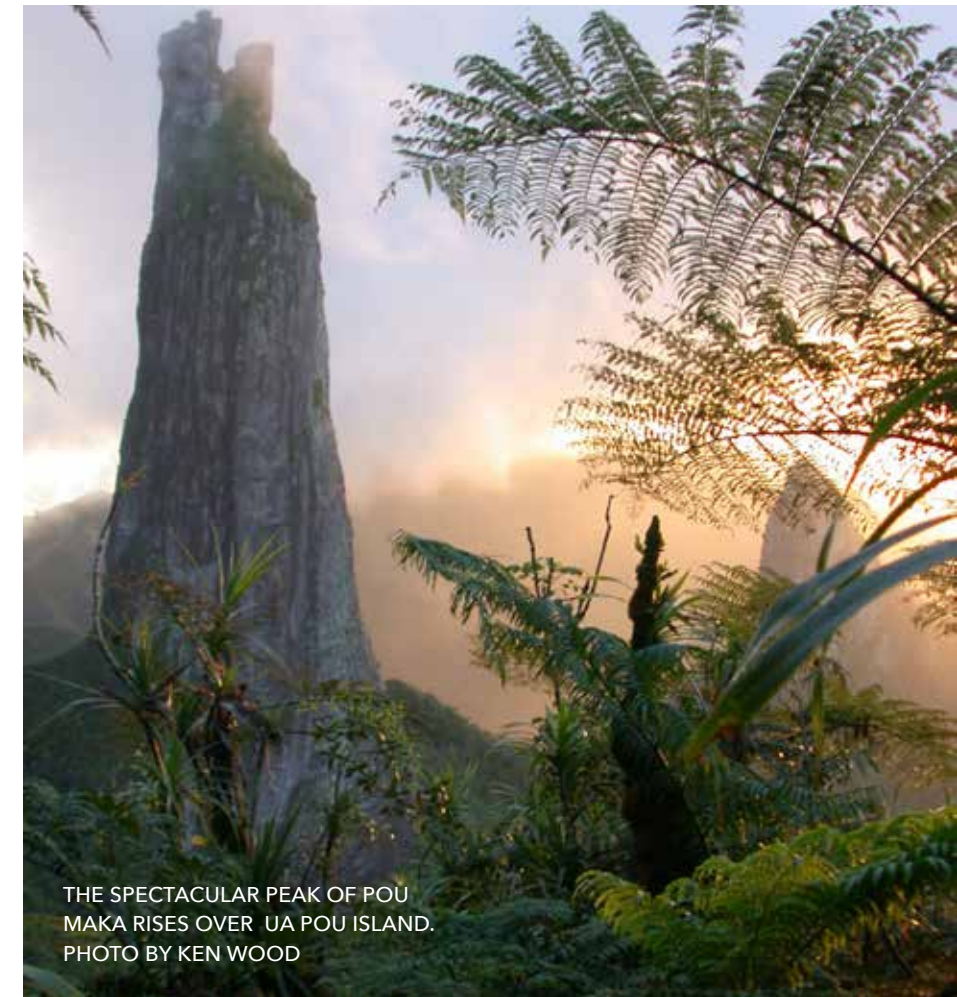


*DRYOPTERIS SWEETIORUM* LORENCE & W.L. WAGNER IS A TERRESTRIAL FERN FOUND ON FATU HIVA NAMED IN HONOR OF NTBG TRUSTEES CYRUS AND BARBARA SWEET WHO WERE MAJOR SUPPORTERS OF THE FLORA OF THE MARQUESAS PROJECT. ILLUSTRATION BY ALICE TANGERINI.

supported and assisted us in numerous ways. We are especially indebted to our friend and colleague Jean-Yves Meyer of the Délégation à la Recherche for critical assistance with planning and coordinating logistics, shipping specimens, trouble shooting, translating, facilitating, and participating in many valuable discussions. Jean-Yves is a rough terrain biologist par excellence with an unparalleled knowledge of the French Polynesian flora and fauna! Wherever we went with Jean-Yves, Marquesans greeted us with warmth and usually considerable interest in our botanical collections.

The Flora of the Marquesas project was one of the first to be fully developed and written by means of a website database and edited into a two-volume work. Based on extensive fieldwork, this flora is a complete account of all of the plants found in the Marquesas Islands, including 85 recently described species, increasing the native flora by 25 percent. The native flora consists of 100 ferns and lycophytes (fern relatives) and 231 angiosperms (flowering plants), with 47 percent of the species endemic to the Marquesas. Of the total 826 vascular plant species recorded for the Marquesas Islands, approximately 495 are aliens introduced by humans, including 248 cultivated, 33 Polynesian introductions, and 214 other naturalized species, compared to the native flora of 331 species. Floristic affinities are with the Society Islands, other Polynesian islands, the paleotropics, and to a lesser degree the Hawaiian Islands and the neotropics.

Spanning over three decades, this project has come to fruition with the publication of Volume 1 in late 2019. Volume 1 includes introductory chapters, lycophytes, ferns, monocots, and specimens studied for the project. It is a complete account of all of the plants found in the Marquesas Islands and is intended to further knowledge of the flora of this remote archipelago. The 415-page tome includes introductory chapters covering the project's history, Marquesas geology and climate, history of plant collecting



THE SPECTACULAR PEAK OF POU  
MAKA RISES OVER UA POU ISLAND.  
PHOTO BY KEN WOOD

in the islands, flora and vegetation, plant communities, threats to the flora, conservation status of species including IUCN Red List recommendations, critical conservation considerations, and many other aspects, as well as taxonomic treatments of the native and naturalized plants. The volume is richly illustrated with 134 figures including 111 color plates, 21 line drawings by Smithsonian illustrator Alice Tangerini, and maps.

A complete list of thousands of botanical specimens studied is given. A second volume will be published in 2020 covering the dicots, dicot specimens, lists of cultivated plants, literature cited, and an index to both volumes. This is one of the first flora projects fully developed and written in a web site database and edited into this two-volume work. We hope this flora will provide an important resource for the Marquesan people in understanding and conserving the unique biodiversity of their islands while preserving essential foundational knowledge of the floristic biodiversity of the Marquesas Islands.

**Flora of the Marquesas Islands, Volume 1 Lycophytes, Ferns, and Monocots** by David H. Lorence and Warren L. Wagner. 415 pages, \$60 + tax and shipping. To purchase a copy, please contact Dr. Lorence at: [lorence@ntbg.org](mailto:lorence@ntbg.org).

# garden sprouts

News from around the Garden

garden sprouts

PHOTO BY BETTY TOULETT



## LIMAHULI WELCOMES NEW DIRECTOR

At the beginning of 2020, NTBG welcomed Lei Wann as the new Director of Limahuli Garden and Preserve. Lei started her career in native plant nurseries and resource management before moving into Hawaiian education where she has spent the last decade.

Lei says she's honored to join NTBG and return to Limahuli Valley, home of her ancestors who farmed kalo (taro), fished, and made a living gathering limu (seaweed), working as paniolo (cowboys), and other traditional pursuits. As the descendant of Limahuli's early resource managers and stewards of the valley, Lei says, "It is with great humility that I walk in their footsteps." Quoting her grandmother Kahili Chu, Lei adds, "Limahuli means to 'turn your hands to work the land' and this is exactly what I intend to do in this position."

PHOTO BY LORNA LOPES



## REINTERPRETING MCBRYDE GARDEN

NTBG has introduced a series of 35 new interpretive garden signs and new booklet for visitors that explain themes for renamed and new trails in McBryde Garden. McBryde Garden has also started interpretive training for gardeners, offering them the background to better appreciate the plants and garden features in their historical context. The completion of the McBryde Garden interpretive upgrades follows the latest training session offered by the National Association for Interpretation.

## NTBG PRESIDENT RECEIVES HONORARY DOCTOR OF SCIENCE

In recognition of his "persistent stewardship of our environment," NTBG President Charles R. "Chipper" Wichman received an Honorary Doctor of Science degree from Florida International University (FIU). Under Chipper's tenure, NTBG began partnering with FIU to address the global threat to tropical plants and educate the next generation of tropical botanists. This partnership led to the creation of the International Center for Tropical Botany (ICTB) at NTBG's garden, The Kampong, in Coconut Grove, Florida. FIU President Mark Rosenberg commended Chipper for his life-long dedication to the discovery, collection, and preservation of plants in Hawai'i and around the world. Following the presentation of the degree, Chipper delivered the commencement class to FIU's graduating class.

LOGO IMAGE: BGCI



## NTBG EARNS BGCI ACCREDITATIONS

NTBG has proudly received two new accreditations from Botanic Gardens Conservation International (BGCI), the world's largest plant conservation network representing gardens in over 100 countries. The designations, **BGCi Botanic Garden Accreditation** and **BGCi Conservation Practitioner Accreditation**, firmly acknowledge NTBG's dedication to enrich life through discovery, scientific research, conservation, and education as described in its mission statement.

BGCI accreditation recognizes the unique skills, knowledge, and well-documented collections in botanic gardens, and emphasizes achievements in plant conservation. NTBG is proud to be among the first accredited globally leading botanic gardens demonstrating excellence and commitment to plant conservation through its programs in Hawai'i, Florida, and elsewhere.



PHOTO PROVIDED BY HAU'OLI WICHMAN

PHOTO COURTESY OF FLORIDA INTERNATIONAL UNIVERSITY



## BREAKING GROUND AT THE KAMPONG

NTBG, in partnership with Florida International University (FIU), broke ground on the International Center for Tropical Botany (ICTB) at The Kampong in Coconut Grove, Florida in December. The collaboration, launched in 2014, will provide a critical facility for researchers and students to advance tropical botany. "At a time when the world needs more people committed to botanical research and plant sciences, both research funding and botany programs are being undercut and abandoned. This only underscores the importance of the ICTB," said NTBG CEO and Director Janet Mayfield. "At NTBG we believe this research center couldn't come at a more vital time."

When complete, the 13,300 square foot center will be used to conduct research, hold meetings, and host educators and students working on issues related to the preservation of biodiversity, addressing climate change, and the conservation of endangered plant species. ICTB will be LEED-certified, adhering to global sustainability building standards, and designed to complement existing structures.

PHOTO BY JON LETTMAN

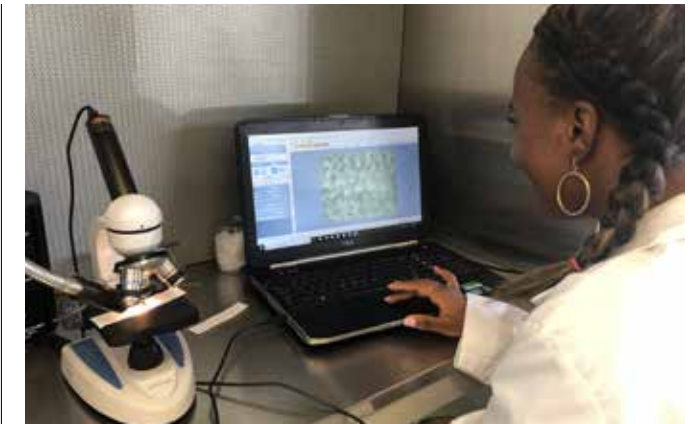


PHOTO BY CHARLY HOTCHKISS

## GROWING PLANTS, GROWING PARTNERSHIPS

NTBG not only grows new plants, it also grows new partnerships with local schools that draw high school and college students, as well as teachers. In recent months, NTBG staff have developed programs in which students can learn how plant conservation and agriculture are related. "Mini-internships" provide students an opportunity to work four-hour shifts once a week to learn about horticulture, agroforestry, and nursery operations. Students can gain hands-on experience, learn valuable skills, while earning credits for school.

Other NTBG-initiated projects collaborate with teachers to better educate their students about stepping-stone programs between high school, college, and future employment opportunities. From the fall of 2019 through this spring, donor generosity has funded two 30-week internships in which a college level intern has been designated to work in NTBG's Fern Lab. This has allowed staff and interns to concentrate on spore collection, grow rare fern spores, conduct growth trials, and meet monthly fern quotas to supply riparian restoration in the Lower Limahuli Preserve.

## CLIMATE CRISIS FORUM ON KAUA'I

In February, NTBG hosted the first of a four-part forum on Kaua'i addressing the climate crisis. Partnering with more than half a dozen organizations, county officials, and individuals, the event gave the community an opportunity to hear from and interact directly with a leaders and experts in waste reduction. With short presentations and "speed dating" style rotating round-table discussions, more than 100 attendees participated. Reflective of the broader community, everyone from keiki (kids) to kupuna (elders) enjoyed a fruitful exchange of information and ideas of how to positively counter and prepare for a changing and unpredictable climate. Future forum dates are April 15 (health and climate change), June 17 (coastal flooding and infrastructure), and August 19 (food security and farming). The Climate Crisis Forum is made possible by a County of Kaua'i Economic Development Department "Energy and Sustainability" grant. Follow NTBG on Facebook, Twitter, and Instagram for upcoming details.

INTERVIEW:

# Dr. Jan Salick

2020 recipient of the David Fairchild Medal for Plant Exploration

JAN SALICK RECORDING DATA  
IN TIBETAN YUNNAN PROVINCE.  
PHOTO BY ROBBIE HART

On February 7th, NTBG presented Dr. Jan Salick, Senior Curator Emerita at the Missouri Botanical Garden, with the David Fairchild Medal for Plant Exploration. Salick, the second woman to be recognized with the medal since 1999, is a globally respected ethnobotanist who has devoted much of her career to the collection and study of tropical rainforest and Himalayan alpine plants.

She has conducted exhaustive studies on the impacts climate change has on indigenous people and the plants upon which they rely.

Salick has also researched how gender and age affect the ways in which people interact with plants, environments, and agriculture. More recently she has worked closely with the Wampanoag and Narragansett American Indians in Massachusetts and Rhode Island to better understand how climate change is threatening plants vital to both cultures. Her work is ongoing assisting with the Narragansett Tribal Food Sovereignty Initiative and with efforts to help reconstruct lost elements of the Wampanoag language.

Prior to receiving the Fairchild Medal at NTBG's Miami garden The Kampong, she spoke with the editor of *The Bulletin* about her long career. Excerpts of that interview, edited for length, follow below.

**Jon Letman: What stands out to you as being the most important, most meaningful aspect of your work?**

My work with climate change and indigenous people — how climate change is affecting both plants and the people and how much more drastic the effects are felt by indigenous people. They really are a bellwether for what's going on. They don't have air conditioning to retreat to and their structures can't withstand some of the terrible storms we've been having so they really feel climate change very immediately and drastically. I've spent the last 25 years of my career on this very important issue.

I've always tried to question the status quo on explanations in ethnobotany. For example, the process of domestication was always seen as a steady march in a particular direction and that we could reconstruct any crop domestication with the same scenario. I took one tropical crop that's very little known, and looked at it and found that none of those standards fit that crop. I suspect that many other crops are equally divergent — that domestication happens in many, many different ways. I'm very pleased that students are picking up on that, coming up with all sorts of explanations for domestication now that were never considered before.

“We spent a lot of our time recording minute details of changes in tiny, little plants up in the alpine. They are so diverse you can’t believe it.”

### What was the name of that crop?

It’s *Solanum sessiliflorum*, also called cocona, and is considered an under-utilized crop plant native to the upper-reaches of the Amazon. It’s like a leathery tomato...you can use it very much like a tomato. It’s a little more citrusy, a little more fruity than a tomato. I even, at one time, made a cocona cookbook so people would know how to use this unknown fruit.

Among the indigenous people that I was working with it was very common. They didn’t use it much, but the kids did. It was a children’s fruit and the concept in itself was interesting to me that the children would interact with plants differently than adults do. I spent a lot of time looking at the differences between how men and women interact with plants differently. It was interesting that children have their own methods.

### How did you come to study the impacts of climate change on indigenous people? Was it gradual or was there an “ah-ha” moment?

It was a bit of an ah-ha moment. It was when I switched from being a professor at Ohio University to working at the Missouri Botanical Garden and that gave me the opportunity to start a whole different epoch of my career. I was sitting back going, ‘I wonder what I should study,’ and all of a sudden it just sort of came to me — it’s climate change. Certainly I had been looking at it for many years. I had been teaching about climate change and I had been seeing the effects of climate change from the 1980s onward.

### You had been working in the tropics. How did you target the focus of your research on the Himalayas?

When I came to the Missouri Botanical Garden, Peter Raven<sup>1</sup> said to me, “I would like people working in

China on other things than just the flora. Would you be willing to do part of your work in China?” I had always wanted to work in China. Two days after I joined the Missouri Botanical Garden I was on an airplane to China for three months (laughs).

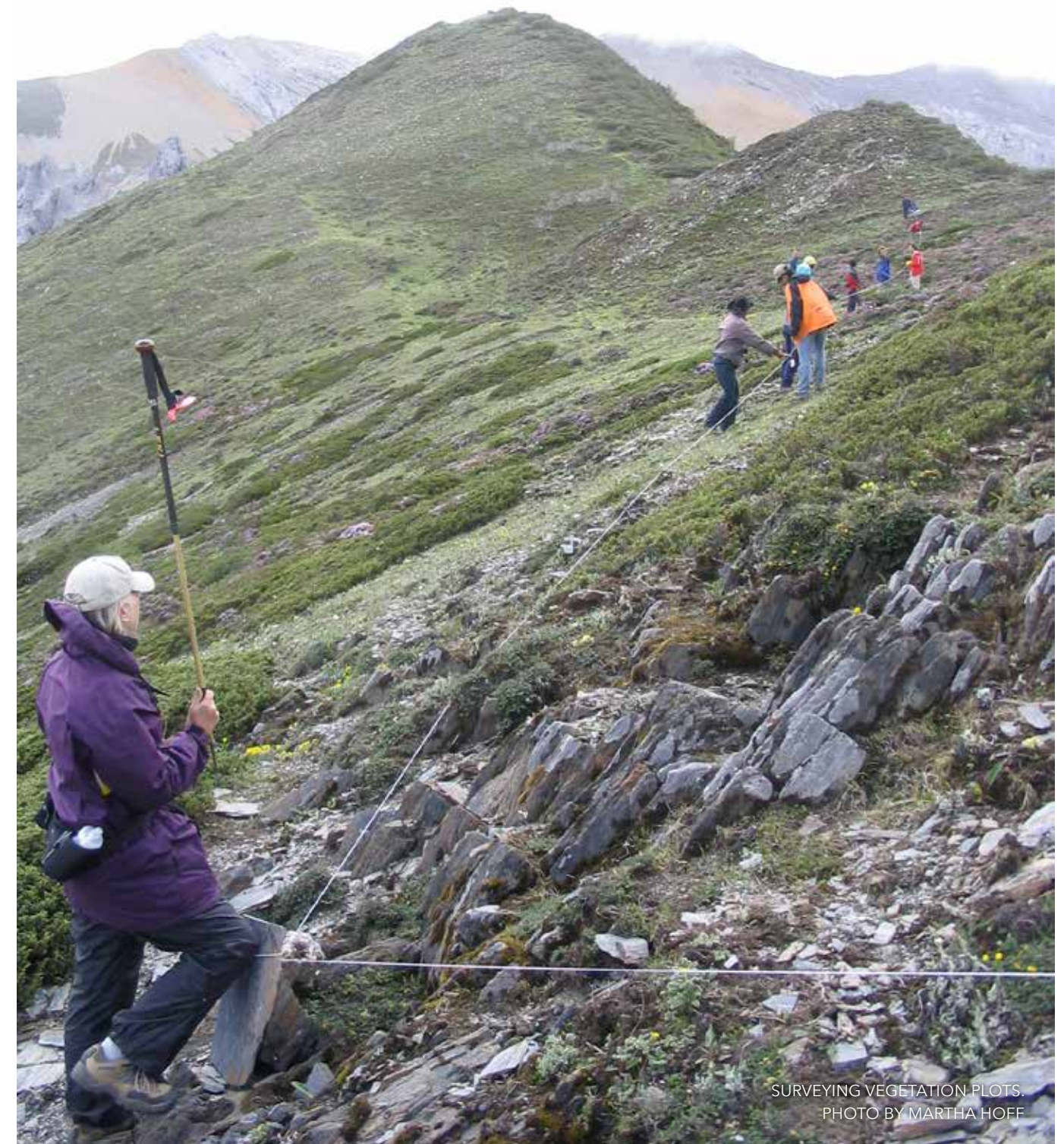
*Once in China, Dr. Salick began exploring southwest China, home to many indigenous cultures. While there, The Nature Conservancy invited her to visit several Himalayan sites. With no particular alpine botanizing experience, at first she was reluctant, but when she visited, Salick was fascinated with what she found. She spent more than two decades studying plants, indigenous cultures, and climate change in China’s Yunnan Province, as well as Tibet, Bhutan, and Nepal. During that time, she says the environmental changes she documented were “tremendous” and advancing much more rapidly than anything she had expected.*

Dr. Salick: I had been to the Himalayas but I had never worked there and The Nature Conservancy said, “Oh, just come and look” (laughs). Of course it’s just drop-dead gorgeous, and the Tibetan people and culture are fantastic and climate change, once you get in the mountains, is so obvious. Next to the Arctic — climate change is the fastest in mountain environments and I already knew I was looking for projects on climate change.

### What are the most outstanding examples of how climate change impacts the Himalayas?

Well, warming is one and increased monsoons, so increased precipitation, is another. Those two things cause a whole cascade of other things: melting glaciers, glacial lake outbursts, changes in agriculture are easily seen. Things like malaria are moving up the mountains so health is being affected. And culture — the quote that always broke my heart was a traditional Tibetan

<sup>1</sup>Dr. Peter Raven, head of Missouri Botanical Garden for four decades, was born in China and co-editor of the Flora of China.



SURVEYING VEGETATION PLOTS.  
PHOTO BY MARTHA HOFF

climatologist — he predicted the weather and made almanacs — he said “climate change may be the nail in Tibetan culture” because they could no longer wear their traditional heavy yak robes and their diet was based on yak butter tea which is very heavy on fats. With warmer weather people were getting heart attacks and diseases they’d never had.

Changes in temperature and precipitation then bring on this whole cascade of factors that are affecting Himalayan people. And then the plants are changing. We spent a lot of our time recording minute details of changes in tiny, little plants up in the alpine. They are so diverse you can’t believe it. On a small scale it’s as diverse as the Amazon. And they’re changing rapidly. 🐉

# supporting roots

Q & A Rob Evans and Terry Micheau



PHOTO BY JON LEITMAN

*Through a series of serendipitous events, Rob Evans (above right) and Terry Micheau have forged decades-long ties to Hawai'i and NTBG. Rob learned to appreciate Hawaiian nature from his father who taught botany and plant physiology at the University of Hawai'i at Mānoa. He first encountered Allerton Garden while living on Kaua'i as a young boy. Terry came to work on O'ahu in the mid-1970s where he met Rob. On a visit to Kaua'i in the late 70s, Rob and Terry first toured what is today McBryde Garden, guided by then-director Dr. William Theobald.*

*With Rob's lifelong love of plants and experience teaching biogeography at San Francisco State University and Terry's passion for supporting environmental organizations, they are committed to helping NTBG fulfill its mission. That same passion has inspired them to join NTBG's Legacy Society, a mechanism that enables Garden supporters to include NTBG in living wills and trusts, ensuring they can continue to support the Garden far into the future.*

## How did you decide to start supporting NTBG?

Rob: It's just something I wanted to do. It's all about the preservation of the ecosystems and the species. The seed bank and the herbarium in the Botanical Research Center is really cool to me. I just had it in my heart and mind that I wanted to give something back to Hawai'i and I wanted to do it on Kaua'i even though I am from O'ahu.

**You've been coming to NTBG for many years. Is there anything here that you haven't experienced but hope to?**

Terry: We haven't seen The Kampong yet but we're going on the NTBG Fellows Trip to Cuba in November. I think we'll try to visit The Kampong before that.

Rob: And NTBG has the Moonlight and Music annual fundraiser which I have not been able to come to yet but I'm making a point to come this year [on August 29].

## You're both active in a number of non-profit organizations. What is it that's so special about NTBG that has earned your support?

Rob: I really like NTBG's effort to preserve Hawai'i's native species, preserving seeds, and planting them to produce more plants that are extremely rare and endangered. I also really like the community involvement — bringing in people from all walks of life. There's an educational aspect, but there's also community involvement working together — “many hands” kind of thing. I also like the acknowledgement and the preservation of the history here — the historical legacy. It's very much part of the community and I like that people can come and learn and see and participate and volunteer. I think it's all great.

Terry: I think for me — I went to the University of Illinois at Urbana-Champaign which is nearby the Allerton Estate in Monticello. That's a connection I didn't really know. As I learned more about the Allerton's legacy and the fact that they were LGBT had something to do with my support with what has evolved from their legacy.

## With your decades-long connections to Hawai'i, has that inspired you to build a relationship with the Garden?

Terry: To support NTBG makes sense. We've been to other great gardens like Kirstenbosch National Botanical Garden and Kew Gardens and but we're not specifically supporters because we're not living in those areas. But NTBG has a special attraction for us because of our history here and because of the founders.

Rob: We've been to Kahanu Garden on Maui too and I was just blown away by it, mainly because of Pi'ilanihale Heiau and I like the display of all the canoe plants. That was cool.

# member events 2020

On February 26, we held our first Member Mixer of the year at McBryde Garden. This new event included an educational tour in the Hawaiian Life Canoe Garden, pupus, and a fun game based on Polynesian canoe plants! This event series serves as a lively opportunity to mingle with fellow members and Garden staff. Save the dates for our upcoming South Shore Kaua'i Member Mixers: **Wednesday, June 10** and **Wednesday, October 28**.

To receive invitations for these events, your membership should be up to date, including your current email address. Please call our membership department at (808) 332-7324 x212 or email [members@ntbg.org](mailto:members@ntbg.org) if you have any questions. To join or renew online, visit [ntbg.org/support/membership](http://ntbg.org/support/membership).

*For a list of upcoming events at all Gardens, visit our website at [ntbg.org/events](http://ntbg.org/events)*

We look forward to seeing you at the Garden soon!



PHOTOS BY HAU'OLI WICHMAN

**MOONLIGHT  
& MUSIC**

SAVE THE DATE

**August 29, 2020**

Reserve your tickets early by calling (808) 332-7324 Ext. 212

A fundraiser for National Tropical Botanical Garden

# an eye on plants

SELECT SPECIES IN FOCUS

## 'Iliau (*Wilkesia gymnoxiphium*)

Native Hawaiian plant enthusiasts and botanists in search of endangered plants frequently go to extreme measures: hours-long treks, fording forest streams, rappelling high cliffs, or using helicopters to reach remote locations.

Not so with the 'iliau (*Wilkesia gymnoxiphium*), a curiously shaped plant in the daisy (Asteraceae) family. This Kaua'i endemic is one of Hawai'i's few endangered plants easily found growing wild in large concentrations. If 'iliau looks familiar, perhaps you've seen the closely related 'āhinahina – the Haleakalā silversword (*Argyroxiphium sandwicense* subsp. *macrocephalum*) found on the volcanic slopes and crater of Haleakalā on Maui.

The genus *Wilkesia*, named for 19th century explorer Charles Wilkes, claims just two species, both endemic to Kaua'i, the taller 'iliau and the critically endangered *Wilkesia hobbdyi*, a dwarf 'iliau.

NTBG Conservation Biologist Seana Walsh calls 'iliau and its close relatives a “textbook example of adaptive radiation,” referring to how it and some 30 other endemic taxa that comprise the silversword alliance evolved from a single plant colonist adapting to different niches across the Hawaiian islands.

So curiously shaped is the 'iliau, with its tall, thin stem and bushy touse of thin blade-like leaves clustered at the top, that it's often described as looking like “something out of Dr. Seuss.” That something, is most surely the *Truffula* trees in Dr. Seuss's 1971 cautionary tale of environmental protection *The Lorax*.

You can see 'iliau close-up by hiking the 'Iliau Nature Loop, a 0.3 mile circular trail in Waimea Canyon State Park. If you're on Kaua'i in late spring or early summer, you have a good chance to see 'iliau in full bloom (May-June) when the spectacular inflorescence bursts skyward like a column of floral yellow-green fireworks.

After the 'iliau flowers, it leaves behind tens of thousands of seeds, some of which have been collected by NTBG's Seed Bank and Laboratory Manager Dustin Wolkis and Seana. In addition to storing the seeds, they've been using them for citizen science and educational outreach with students from high schools from Hawai'i and California. They have also led visiting interns and teachers in conducting dormancy and viability studies comparing current findings with decades-old studies to better understand how pollination may change over time.

At NTBG's Seed Bank and Laboratory, student and interns assess “seed fill” (examining seeds for the presence or absence of an embryo), an indicator of whether a flower had been pollinated or not. The students also prepare petri dishes with blotter paper to assess germination and document data their findings. It's a chance for students and teachers to ask questions and play an active role in analyzing data in real time.

Seana says the activity is a great way for students to experience working in the Seed Lab first hand, and get their hands on seeds.

With this much access to 'iliau, it can be easy to forget that it is, in fact, endangered and has a very limited and declining habitat. What's more, it's threatened by invasive plants, and predation by pigs, rats, goats, and deer. 'Iliau, much like the *Truffula* trees, needs to be preserved. In the words of Dr. Seuss:

*“It's a Truffula Seed. It's the last one of all! You're in charge of the last of the Truffula Seeds. And Truffula Trees are what everyone needs. Plant a new Truffula. Treat it with care. Give it clean water. And feed it fresh air. Grow a forest. Protect it from axes that hack. Then the Lorax and all of his friends may come back.”*



PHOTO BY JON LETMAN





## National Tropical Botanical Garden

3530 Papalina Road  
Kalāheo, Hawai'i 96741 USA



INTERNATIONAL YEAR OF  
**PLANT HEALTH**  
2020



*BLECHNUM VULCANICUM* IS AMONG ONE HUNDRED NATIVE FERNS DOCUMENTED IN THE NEWLY PUBLISHED FLORA OF THE MARQUESAS ISLANDS. READ MORE ON PAGE 12. PHOTO BY KEN WOOD