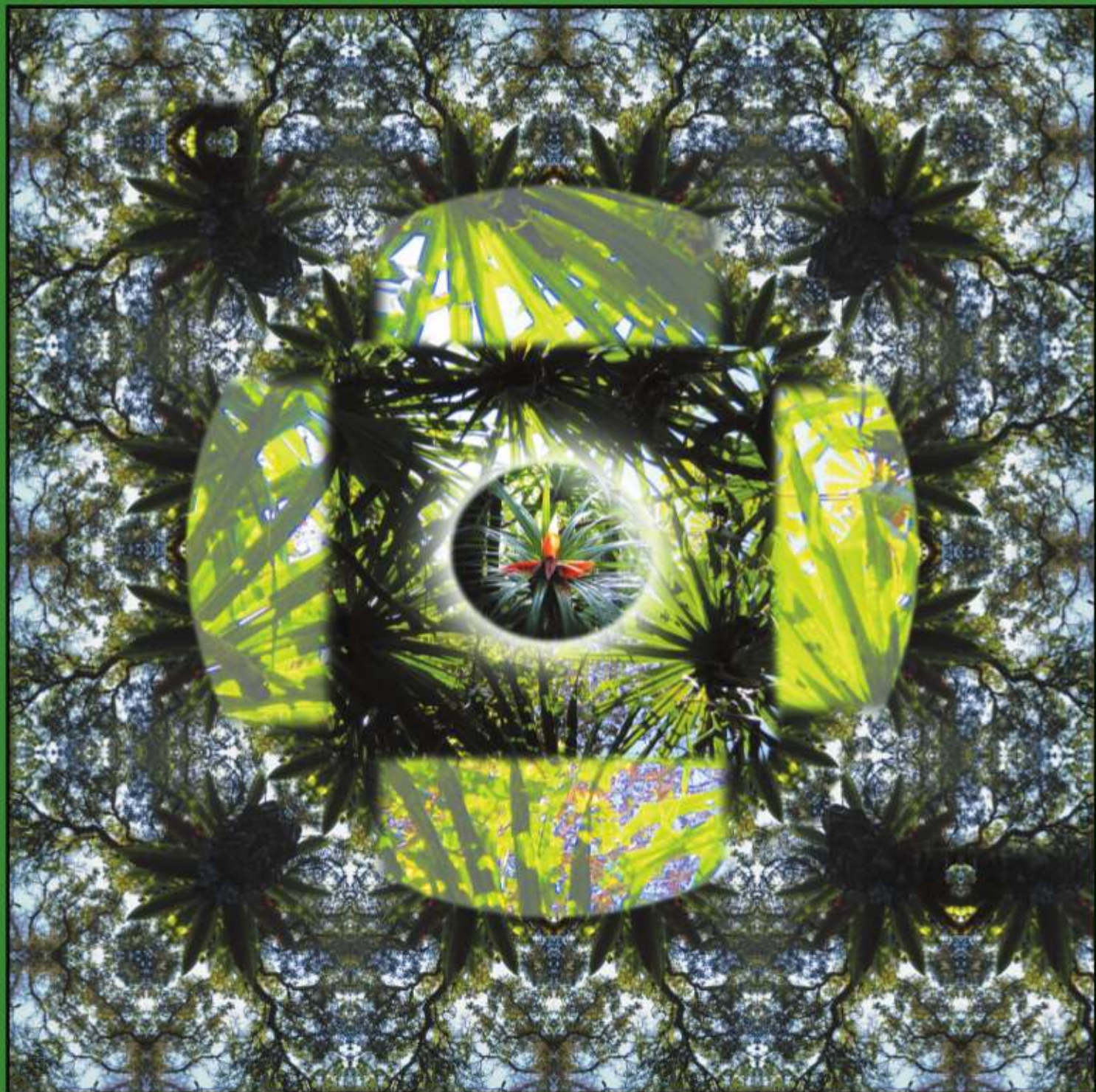


# Hawai'i Plant World Essentials

## *A Guide to Wise Plant Choices*



Jaya C. Dupuis



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*Jaya C. Dupuis*

*Photography by author*

Aloha,

Thank you for your purchase! Book proceeds and donations help fund protection of the Keau'ohana Native Rainforest and Hawaii's unique lowland environment. Your support is critical to our field restoration work, and to educating students, residents and visitors about native species/forests and issues of invasion.

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Mahalo Nui Loa!

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## ***Stands in Brilliant Composition***

*Stands in brilliant composition*

*The green growth entwined, by branch and by root*

*Forest pockets proclaim themselves in plain view*

*Uttering an ancient essence, and origin beyond human*

*A fragile glimpse, that in itself supersedes strife*

*A niche not nebulous to those embraced*

*Shaded in an order of diminishing grandeur*

*Far into the moss covered bottoms*

*So lovely is apportioned the diversity of lives*

*Beyond the appetite of impenetrable invasions*

*Lasting remains in lingering potency*

*Hover, between the likely, and the possible*

*C. J. Dupuis*





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I offer my deepest appreciation to beloved family members and forest friends, who have shown enduring encouragement and support throughout my years of study and dedication to native lowland vegetation communities in Hawai'i. I give special thanks to Ann Kobsa, a treasured friend, mentor and most dedicated ally of native lowland vegetation species, for her kind generosity and support on 'all' levels, including the editing of this book. Sincere thanks to Jon Rathbun as well for his many contributions to the forest and to the book's development. *Mahalo nui loa*, much thanks, to all the wonderful volunteers who have contributed time and *Aloha* toward the restoration of our last remaining Hawaiian native lowland rainforest.



# Preface

Born in North Ontario Canada, Jaya C. Dupuis has been developing a small subsistence farm on the Big Island of Hawai'i since 1989. Out of a particular interest in the conservation of remaining native forests and plant species in Hawai'i, Jaya obtained a master's degree in Tropical Conservation Biology and Environmental Science at the Hilo University of Hawai'i in 2012. To better understand lowland wet forests of East Hawai'i and the effect of invasive species throughout the region, Jaya's research took a landscape-level approach, surveying plant cover across five lowland Puna District Forest Reserves. This research examined plant distribution patterns for the development of effective restoration measures in remaining native plant communities of Hawai'i.

In June of 2014, Jaya launched Keau 'ohana Native Rainforest Restoration(KNRR), an intensive restoration project in the Keau'ohana Forest Reserve of East Hawai'i. The project strives to systematically control invasive species and propagate native species on over 30 acres in what is the largest and most intact biodiverse native lowland rainforest remaining below 1,000 feet in elevation in the State of Hawai'i. This project operates through the environmental nonprofit Malama O Puna, based in Pahoa town. It has thus far been supported by the State Legislature (Grant-in-Aid) through appropriations made by the Department of Land and Natural Resources; county contingency funds and other private donations have also been awarded. Community volunteer support has contributed a great deal to restoration efforts in Keau'ohana, as KNRR coordinates quarterly volunteer events and hands-on educational opportunity in the forest with many school groups and community member. The Keau'ohana Native Rainforest Restoration Project has greatly expanded upon community volunteer service events, offering school groups hands-on educational opportunities as well.



In developing this manual, Jaya's hope is to promote awareness of low elevation vegetation, to inspire the appreciation and re-integration of native species into our lowland environment for esthetic and natural history purposes, as well as to support the control of introduced species that threaten native forest integrity and environmental balance in general.

This guide offers a practical and fundamental approach to helping landowners and local



residents make informed decisions about plant control and propagation choices in Hawai'i. Despite some plant variations, the information provided in this booklet can generally be helpful to landscapes across the Hawaiian Islands. It offers simple direction to local community members interested in learning about Hawai'i's lowland native plant species and rainforests, and intends to support their restoration and conservation.

As we continue to lose many native ecosystems to urbanization, agriculture, and invasive species in Hawai'i, there is a growing need to restore and conserve a full range of native biodiversity and forest types across the entire elevation gradient. Though the process of invasion by exotic species at lower elevations cannot be entirely reversed, remaining native plant



species and communities can be supported in their re-establishment and resilience. With focused community awareness and intention, lowland vegetation communities, and the general lower elevation landscape, can be greatly improved in native biodiversity and ecosystem health.



## *Allow Us Ancestors*

*Allow us ancestors, please  
Bring special care  
To this profound place*

*This profound place  
Dwelling in the center  
Of the great ocean*

*Of the great ocean  
Allow us, rise into the heights  
As each morning sun*

*As each morning sun  
Spread the warm rays  
Through to green forest floor*

*Through to green forest floor  
Where our roots may gather  
And tender shoots prosper*

*And tender shoots prosper  
To towering tree  
The air we breathe*

*The air we breathe  
Allow us, attain ancestral insight  
With wisdom to welcome*

*With wisdom to welcome  
The joyful and Godly realms  
Upon this earth*

## *Ho'oku'u Kākou*

*'Olu'olu, ho'oku'u kākou  
E hō mai mea I wae 'ia malama  
Iō keia, hohonu wahi*

*Iō keia hohonu wahi  
E noho I ka piko  
O ka moana nui loa*

*O ka moana nui loa  
Ho'oku'u kākou e ala I loko nā  
Me kēlā mea kēia mea kakahiaka lā*

*Me kēlā mea kēia mea kakahiaka lā  
Laha mahana nā wana  
Ma ia ma'o nā ulu lā'au papa*

*Ma ia ma'o nā ulu lā'au papa  
Ai hea ko kākou a'a paha hui  
A me palupalu pana ho'owainai*

*A me palupalu pana ho'owainai  
'Ia 'ale'o kumu lā'au  
Ka papalani hanu kākou*

*Ka papalani hanu kākou  
Ho'oku'u kākou, kū ike kūhohonu o nā kupuna  
Me ka na'auo ia heahea mai*

*Me ka na'auo i heahea mai  
Nā hau'oli a me ke akua aupuni ao  
Maluna kēia honua*

*C. J. Dupuis*



# Introduction

If we know Hawai'i's landscape history, we understand how the massive mountain slopes of Mauna Kea and Mauna Loa have been utterly denuded, largely by feral ungulates. An onslaught of invasive weeds has only exacerbated the environmental damage. Once the land was covered with native forests, ferns and flowers, carpeted with green mosses, bursting with life forms found nowhere else on the planet. Today many areas are a weedy mess of thorns and thickets, despite growing environmental awareness and restoration efforts island-wide.

As an isolated tropical archipelago, Hawai'i is home to over 1,000 native flowering plants, 90% of which are found nowhere else in the world. Yet on a day to day basis,



as people traverse the lower elevation landscape of Hawai'i, we do not have the privilege of seeing or enjoying many native species. Tourists, and even local residents, often assume that the exotic beauty we are surrounded by in Hawai'i is native. Very few native plant species are today scattered across Hawai'i's developed lowlands; and they are confined to increasingly compromised forest fragments. The most intact of these fragments is found in one of five Puna District Forest Reserves on the east side of the Big Island, Keau'ohana Forest Reserve, and only includes 30-35 acres of native biodiverse forest.

The damaging effects of certain post-contact animal and plant introductions on native forests and on the general lower elevation environment are well understood by few. There is a great difference between a forest that can sustain a biodiversity of life-forms and a forest that is depleted of richness and abundance, health and vitality. If some of the lowland forests are to be preserved, the public must become more aware of the vegetation dynamics that occur as a result of past and present practices.



Though finding solutions to invasive species problems is far from simple, among the most important measures to improving the situation are to increase public awareness and engagement. From that point, we as local community members can begin making the connection between our gardens and our forests, and taking a more conscious role in balancing our ongoing influence on the vegetation patterns. The choices that we make about which plants to propagate or control in our gardens have tremendous implications for the future of Hawai'i's environmental health and integrity. Our gardens, and therefore we as a people, are dependent on our local forest systems to draw in moisture from the clouds as they rise up the mountain slope. Our very survival requires this function of nature on a bioregional as well as global level. The connection between our forest and our belly has been missed, and this is a prominent factor in the dramatic climate fluctuations of our day. To help maintain the health of our native ecosystems is to ensure our own health as humans as well as that of many other living beings. The forest is our long-term sustenance; it is the air we breathe, the water we need to drink and to raise our food.

Remaining lowland wet forests of Hawai'i are today reservoirs of rare native biodiversity. It is a sacred responsibility to manage them as best we can, and this task is no longer possible without the concerted effort of people who reside on or visit these lands. Protection of this unique environment supports native communities, providing habitat for native bird species such as the 'amakihi, the 'apapane, and the Hawaiian hawk, and rare plant species, such as ha'iwaile (*Cyrtandra nanawaleensis*), which is largely restricted to lower Puna and federally listed as endangered. Its co-occurrence with rare species such as 'ohe (*Polyscias hawaiiensis*), ōpuhe (*Urera glabra*), 'ahakea (*Bohea timonioides*), and maua (*Xylosma hawaiiensis*) makes for a unique forest type. Aside from being aesthetically pleasing, native plants have many practical and cultural uses, as well as healing properties. By incorporating them into Hawai'i's lower elevation home gardens and general landscape, we honor the life-forms that have been in Hawai'i for millions of years before human arrival. Having an appreciation both of the history of this land's natural environment and of Hawaiian culture is fundamental to the experience of being in Hawai'i, of understanding and living 'Aloha'. It is a privilege to live in a place of such beauty! May we as lovers of Hawai'i's beauty, become conscientious stewards of its thriving natural environment.







# Plant Distinctions

Clarifying the distinctions between *native*, *Polynesian-introduced*, *non-native*, and *invasive* plant species is key to preserving what little remains of Hawai'i's native lowland rainforests, and supporting the biodiversity and vitality of Hawai'i's low elevation landscape in general. A list of some of the more common lowland species found within these groups is provided in this manual, along with images to help with species identification.

*Native* plants comprise both endemic and indigenous species. They were not brought to Hawai'i by humans; other forces of nature such as the wind, ocean currents, and birds carried their seeds or propagules here. *Indigenous* plants are native to other places in addition to Hawai'i, but *endemic* plants exist nowhere else in the world. The Hawaiian Islands are unique regarding their endemic life because of their isolated location in the



mid-Pacific Ocean. Because Hawai'i is so far removed from any continental mass, the relatively few species that did arrive on the Islands evolved over millions of years and speciated into countless new species we call endemic. With little competitive pressure, these species did not evolve to compete with the recently introduced, faster growing and better-



dispersed species. Native plants have tended to lose their defenses against predators, such as prickles and poisons, and they became more fragile and vulnerable. Today many Hawaiian endemic species have become extinct, and many more of them are endangered to become so. Endangered species are now strongly protected by the State and Federal Government, however there are many species of concern that are not yet listed or protected.

***Polynesian-introduced*** plants, otherwise known as the ‘canoe plants’ (40 to 50 species), most of which are important to human survival and/or hold strong cultural value, arrived with the early Hawaiians as early as 300 A.D from Polynesia. Although most Polynesian plant introductions can be found in the wild, they have been relatively benign regarding their impact on the native plant communities.



***Non-Native Introductions***, also known as *exotic* or *alien* species, refers to all plants that were brought here by humans. Of well over 8,000 species introduced to the Hawaiian Islands since European contact, ~1,000 have become naturalized in the wild, but less than 100 of these are considered seriously invasive.

***Invasive*** plants are introductions that are particularly aggressive, have a detrimental effect on native species, and have the potential to alter whole ecosystems. Many invasive species form monotypic stands (single species *vs* biodiverse), thereby decreasing biodiversity, a key component of a healthy ecosystem. They tend to replace rather than coexist with native species. Their effects on native plant communities include competition for water and nutrients, displacement through shading and seedling suppression, and toxicity to other species, called allelopathy. Invasive species are today a principal threat to native biodiversity throughout the Hawaiian Island chain.

Though present-day plant distribution patterns reflect a number of factors, the continual loss of habitat is a prominent threat to the survival of native species. Land conversion by agriculture and residential development is increasingly fragmenting the landscape and is rapidly degrading native plant communities. Numerous historical events have also impacted Hawai‘i’s ecosystems statewide. One example of this was a large scale out-planting of 948 exotic species into forest reserves between 1910 and 1960. Although





the purpose of this enterprise was to restore Hawai'i's deteriorating watersheds, it surely accelerated the spread of invasive species. Raising vast herds of cattle, and maintaining populations of feral ungulates over almost the entire Hawai'i landscape has had a devastating impact on native ecosystems. It is never too late for us to become accountable for our ancestors' mistakes, and for our current deficits in understanding and foresight regarding environmental choices.

