

Annual Report of Hawaiian T&E Plants, at Palomar Community College



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Volume 1

This report indicates the current status of the seeds and any subsequent seedlings from the collections made of cultivated T&E seeds from the Honolulu Botanic Gardens, National Tropical Botanic Garden, and the Waimea Valley Arboretum in the spring of 2013.

Prepared by:

Antonio Rangel

Palomar Community College

Facilities Department, Grounds Services

&

Friends of the Palomar College Arboretum

1140 West Mission Road
San Marcos, California 92069

Introduction

In the summer of 2012, I made a formal request to collect and bring back to the mainland, seeds from cultivated stock of some Threatened and Endangered plant species. Charmian Dang, who is the Rare Plant Permit Coordinator from the Division of Forestry and Wild life of the Hawaii Department of Land and Natural Resources, was the person contacted. She instructed me on the process and in early 2013 permission was granted from both the Hawaii Division of Forestry and from the US. Fish and Wild Service. *The original email request is stated below:*

“Personally; as far as collecting goes, I would like not to collect T&E specimens from the wild population, as our climate, although similar to Hawaii, does get rather frigid here during the winter months. I would hate to lose genetic material that would be best grown in more favorable conditions. That said, second or third generation seed, although still valuable might better suit the risk. I hope to collect from respected Botanical Gardens like; Waimea Valley, the Honolulu Botanical Gardens and the National Tropical Botanical Garden, which have supplied us with great opportunities for outreach thus far. With the goal of growing of some of the T&E species here, so that can function for educational outreach purposes.”

The original species requested could not all be collected, as seed was not readily available from the above sources. The intent was to grow the species in the nursery at the college, and when large enough for out planting, to plant them in specific garden areas for public display.

The list of species requested can be seen below.

- *Albutilon menziesii*
- *Albutilon sandwicense*
- *Argyroxiphium kauense*

- *Argyroxiphium sandwicense*
- *Caesalpinia kavaensis*
- *Cyanea angustifolia*
- *Cyanea leptostegia*
- *Gardenia brighamii*
- *Hibiscadelphus distans*
- *Hibiscus brackenridgei* ssp. *brackenridgei*
- *Kokia dryanoides*
- *Munroidendron racemosum* (Syn *Polycias racemosum*)
- *Pleomele auwahiensis*
- *Pleomele forbesii*
- *Pleomele hawaiiensis*
- *Pritchardia munroi*
- *Pritchardia viscosa*
- *Sesbania tomentosa*

Due to pest problems in the greenhouse and concerns of committing all the available seeds to first trial failures, some of the seed was held for planting until late winter (February 2014). It was hoped that any problems and mistakes could be remedied so that we might have success with at least a few of the species collected in the long term. This was not the original intention, as we had hoped to plant all the seeds within a few weeks upon arrival back on the mainland. All seeds were inspected by the Hawaii Department of Agriculture and the US Department of Agriculture prior to leaving the islands. They were then inspected and cleared by the California Department of Agriculture on April 10th, 2013.

In the fall of 2013 the new Teaching & Learning Center was completed at the San Marcos Campus and officially opened to students in January of 2014. The gardens that surround the center were designed to exhibit plants native to Hawaii and greater Polynesia. In addition, plants that are native to South East Asia, but were vital to the Polynesian migration across the Pacific Ocean have also been planted in this location. The only exceptions are the low growing grasses and sedges, which are California natives. In addition to grasses we planted Pineapples

which were brought to Polynesia with the Europeans. These plants were at one point a vital part of the islands economy. An interesting, but sad part of Hawaiian natural history is that the Europeans cleared much of the lowland forests to make way for the planting of Pineapples and Sugar Cane. So grasping at an educational opportunity; this is why Pineapples were planted in the Garden. There is also a slightly older test garden planted by the Boehm Gallery that contains similar plants.

Of the seeds collected in the spring of 2013, only one grew rapidly enough to plant out in the garden thus far. The nursery contains many more species of unique plants native the Hawaiian Islands, as well as greater Polynesia. When they become big enough to plant out, we will add them to the garden in the hopes that they might act as ambassadors for conservation. If nothing else, just being in the garden they provide every visitor a chance to see how beautiful and diverse our world is and hopefully entice at least a few to take some active role in the efforts to protect it.

The Following Botanical institutions provided seeds for nearly all of the Hawaiian Native plants in these gardens.

[The National Tropical Botanical Garden](#)

[NTBG The Honolulu Botanical Gardens](#)

[The Waimea Valley Botanical Garden](#)

Soil Type for Planting

The soils at the San Marcos Campus are primarily clay and garden beds must have soil amendments added to improve drainage and nutritional composition. In an attempt to lessen “Out-planting” shock, we try to mix soils that are similar to our native soils after amendments have been tilled in. This does create some issues with drainage in

nursery containers, but has helped a bit with minimizing “Out-planting” shock.

For the T&E seeds planted in the spring and early summer of 2013, a mix of Loamex (composted Incense Cedar shavings) and a 70/30 top soil was used for germination. This soil proved to be too heavy for many of the species and thus all later plantings throughout 2013 were done in Loamex only. After speaking with Mike Demotta from NTBG, he suggested that we use pumice or perlite for at least the last of the seeds of *Hibiscadelphus distans*. Sunshine Mix #3 was chosen as a substitute for all seeds planted in the spring of 2014, as this mix has proven to be slightly more favorable than the Loamex in a few trials with similar species. The overall structure of Sunshine Mix 3# provides a superior balance of moisture retentive, aeration and drainage properties.

Campus Nursery

The nursery on campus contains four primary structures and a temporary hoop house that is skinned with plastic in the winter, on an as needed basis. The nursery is approximately one half acre in size and is completely fenced in.



(From Left to Right Top to Bottom)

Shade House, Hot House, Sun Yard, Green House

Garden Areas As Of Fall 2012

The following images are of the Hawaiian Native Plant "Test Garden" and the TLC site, before construction was completed.



Hawaiian Native Plant Test Garden



(From Left to Right Top to Bottom)

West side, East side, North side, South side

Seed Status, As Of Spring 2014

The data shown in the chart below shows that only 3 species are still represented in the seed bank at the college. The three species collectively yield a total of only twenty seeds. The best represented

species currently in the seed bank is *Sesbania tomentosa*. Although *Abutilon sandwicensis* was not planted until the spring of 2014, we have high hopes for this species!

Genus species	Planted 2013	Planted 2014	Remaining in Seed Bank
<i>Gardenia brighamii</i>	25	0	0
<i>Caesalpinia kavaensis</i>	9	0	2
<i>Abutilon sandwicensis</i>	0	25	0
<i>Abutilon menziesii</i>	12	13	0
<i>Abutilon eremitopetalum</i>	15	10	0
<i>Sesbania tomentosa</i>	7	0	14
<i>Hibiscadelphus distans</i>	21	0	4
<i>Polycias racemosum</i>	25	0	0

Number Of Seeds Germinated

The information in the chart below shows the status of seedlings germinated from the T&E seeds collected in 2013. As you will see the total number of seedlings of T&E species from this collection is currently at 9.

The greatest success was with the *Sesbania tomentosa* seeds. These plants have been very vigorous and show great promise for outdoor cultivation in Southern California. In fact due to their fast growth and apparent cold hardiness, in the coming weeks the remaining plants of this species will be planted in the gardens.

The most frustrating losses have been from the *Gardenia brighamii*, *Polycias racemosum*, and *Caesalpinia kaviaensis*. The first two species also have great promise for cultivation in Southern California, as I have seen nice specimens at the San Diego Zoo and San Diego Botanic Garden. However, the seedlings from this collection did not fare well. Mike Demotta from NTBG has indicated through verbal communication that *Polycias* seed does not store well and that this batch of seed was possibly a few years old.

Genus species	Germinated	Alive at Present
<i>Gardenia brighamii</i>	3	0
<i>Caesalpinia kawaiensis</i>	4	1
<i>Abutilon sandwicensis</i>	0	0
<i>Abutilon menziesii</i>	2	0
<i>Abutilon eremitopetalum</i>	0	0
<i>Sesbania tomentosa</i>	7	6
<i>Hibiscadelphus distans</i>	3	1
<i>Polycias racemosum</i>	1	1

Pest Problems

As is often the case, plant pests tend to be problematic in closed environments like greenhouses and hothouses.

The plant pests listed below have shown an affinity for the plant species currently being grown in the greenhouse.

- *Tetranychus* sp. - **Red Spider Mite**
- *Trialeurodes vaporariorum* - **Greenhouse White Fly**
- *Pseudococcus* sp. - **Mealy Bug**

Red spider mite has been voracious on the foliage of the *Sesbania tomentosa* and *Gardenia brighamii* in the greenhouse. Sadly, of the three Gardenias that germinated, two died from the infestation early after germination and the third a few months later. In Early February one of the 5 gallon *Sesbania tomentosa* also perished due to the spider mites. This problem will continue to be monitored and treated in the spring of 2014. For now the plants are washed thoroughly with water to keep the mite population to small numbers. The sole specimen of *Sesbania* in the garden has not been affected by any pest to date.

The only plants to be attacked by Greenhouse white Fly are the *Hibiscadelphus* and the *Abutilon menziesii*. This pest is minimal and has not been problematic,

as the numbers are low and can be manually removed when seen. Although the *Abutilon* did strangely wilt and die in early February of 2014, I assume it had much more to do with some other stressor (possibly cool soil conditions) than the rare occasional white fly.



***Sesbania tomentosa* in greenhouse with Mealy bugs and ants congregating near axial buds at leaf nodes.**

The Mealy Bug has only been seen on the *Sesbania* and was sprayed with 75% alcohol which killed the pests quickly. The mealy bug was seen gathered around the newly emerging lateral or auxiliary buds and were tended to by ants.

Response to Cold

In mid-December of 2013 the San Marcos area was subject to its first frost of the season. Temperatures dropped into the 28-32 degree range twice during the same week, and only a few days apart. The area known as the Polynesian Garden received little to no frost damage. The temperatures in the greenhouse tend to drop to the mid-thirties when outside temperatures drop below 32 degrees F at night. This only occurs a few times a year and for very brief periods as the house quickly warms back up to above 75 degrees F during the early morning hours.

The soil temps of the potted plants tend to hover around 45-55 degrees F during this period. This allows us to better determine what plants can survive outside and tends to lessen the loss of large greenhouse plants once moved to the outdoor shade house or when planted in the landscape.

The only plants to show any damage were some young *Pritchardia hillebrandii* palms. These palms when small and newly planted, often suffer frost damage the first year after planting. Surprisingly the *Sesbania tomentosa* showed no signs of frost damage, despite being planted in an area where a light frost had set only few feet away. Though a 15 gallon specimen of *Sapindus soapinaria* was planted nearby, it is still too small to provide any protection from a heavy frost. All of the other plants on the list below that are currently in the greenhouse, have fared well and showed no signs of cold damage to date.

- *Caesalpinia kaviaensis*
- *Sesbania tomentosa*
- *Hibiscadelphus distans*
- *Polycias racemosum*



Sesbania tomentosa

In Garden, Early February 2014

Garden Areas As Of March 2014

The following images show some areas of the Polynesian Garden as it was on March 6th, 2014.



A view of the South Plaza of the new Teaching & Learning Center



(From Left to Right Top to Bottom)

West side, East side, North side, South side

There are so many species to see in the garden that to include them all would be impossible here. I have included a few images below of some other species growing in the garden.



***Sida falax*, A common plant throughout the Tropical Pacific. In Hawaii it is known as 'ilima.**

Frequent drought conditions are common place events in California. In San Marcos at the main campus it is rare to receive more than 18 inches of precipitation per year. As a result water management strategies are a significant concern and played a major role in the garden design. Many of the plants have bubblers that irrigate only them on an as needed basis. This minimizes wasted water in the large expanses where lava rock was used as ground cover/mulch.



***Clianthus puniceus*, a Critically Endangered plant from New Zealand. In Maori it is known as Kaka Beak.**



2 *Metrosideros collina* 'Spring Fire' flank a large *Metrosideros excelsa*. *M. collina* is native to most of Polynesia, including the Marquesas Islands and Samoa. It is called Vunga. The Maori name for *M. excelsa* is pohutukawa.

Educational Outreach

Growing T&E plants is a great undertaking and it comes with a responsibility to share your knowledge and findings with others, as well as take advantage of educational opportunities when they arise. Ex-situ and In-situ conservation efforts are important, but so is educating the public why we botanical institutions do the work we do. The intent of growing these species on campus first and foremost was to create a unique garden that would showcase plants that are in peril from Hawaii and Greater Polynesia.

Each species when they are planted in the garden are given a plaque or label. These labels provide some basic information concerning the plant. The scientific name of the plant is given, as is the plants common name (often in Hawaiian or another Polynesian language), the place of origin, botanical family and the IUCN Red List status or USFWS listing status. By giving visitors insight as to what they are looking at, these labels help to educate the public

and have the effect of engaging them in thought and further discussion.

The spring Newsletter put out by the Friends of the Palomar College Arboretum, will showcase the original “Hawaiian Test Garden” and the new Polynesian Garden. Also in late March of 2014, I will be giving a tour of the Gardens to the Classified staff on Campus. We expect to see anywhere from 15-60 staff in attendance. We will be looking at these gardens from an ethnobotanical and environmental point of view. We will also discuss the work we are doing in the nursery to help conserve these species through cultivation. In the fall we will be offering the Faculty a similar learning opportunity. These outreach opportunities have the eventual effect of trickling down the information to the students and the community.



An example of the garden plant labels

At this point, collectively these approaches only scratch the surface at the possibilities, but they do meet our goal of conservation through education and cultivation. As time progresses we will certainly improve upon our educational program and hope that the end result, will be that our visitors are one step closer to contributing to a society that is willing to sacrifice, even if just a little, to preserve our planets beautiful biodiversity.

Conclusion

The opportunity to grow unique and rare plants such as the Hawaiian T&E species listed above has provided us new insight as to their cultural requirements and tolerances. Although we have had success with some species, we have also had failures with others. Our last minute decision to hold back seeds of some species for later plantings seems to have been a wise decision, as we might have otherwise lost more seeds and seedlings to some the problems listed above. Now that we have the much needed firsthand knowledge as to each species needs, genetic restrictions and tolerances, we have a better chance at successfully cultivating the remaining seeds.

As we move forward in our efforts to grow many of these rare and unique species we will no doubt continue to learn more about their adaptability and survivability in new habitats. This information may help in conservation efforts, but will at least provide us with an opportunity to share our discoveries with others and no doubt for some species who can adapt to California's climate, they will have the chance to serve as ambassadors for conservation to the students, staff, faculty and the community.

Palomar Community College District,

Interim Grounds Services Supervisor

I.S.A. Certified Arborists

WE-8721A -Antonio Rangel

A handwritten signature in black ink, appearing to read 'Antonio Rangel', is written over a horizontal line.

Date: March 10, 2014

