

**Hawaii Invasive Species Council
FINAL REPORT
April 30, 2015**

Proposal Title: Surveillance of Myrtaceae Rust Strains in Hawai'i

Content area: Prevention

Project period: February 2014 – February 2015

Applicant: Rob Hauff, DLNR Division of Forestry and Wildlife
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Partners: -Aileen Yeh, Forestry Consultant Services, contracted surveyor
-Dr. Janice Uchida and Chris Kadooka (University of Hawai'i, College of Tropical Agriculture and Human Resources) genetic analysis and host range testing of disease samples
-Phil Cannon (USDA Forest Service Region 5 Pathologist), technical advice
-Dr. Flint Hughes and Travis Sowards (USDA Forest Service, PSW Research Station), technical advice and survey assistance
-James Parker and Robert Parsons (Big Island Invasive Species Committee), survey assistance

Total Expended: \$15,000 (matched by \$15,000 from USDA Forest Service, State & Private Forestry)

Executive Summary:

Myrtaceae rust (*Puccinia psidii*), also known locally as 'ōhi'a rust and in other parts of the world as eucalyptus rust, was first detected in Hawai'i in 2005 on a 'ōhi'a seedling in a nursery on O'ahu. The rust quickly spread throughout the state and has been found infecting 38 hosts in the Myrtaceae family, including 5 native species (see Table 1). The primary concern with this disease is the potential impacts to 'ōhi'a, which is only minimally susceptible in forest settings thus far. However, the introduction of additional disease strains could be very damaging to 'ōhi'a forests. Due to this threat, state and federal quarantine agencies are developing restrictions to prevent importation of infected plant material into Hawai'i. In order to justify such rules, verification that Hawai'i only has one disease strain is crucial. **The results of this survey support the claim that only one disease strain, referred to in the scientific literature as the "global pandemic biotype," occurs in Hawai'i.**

The survey was carried out by consulting forester, Aileen Yeh, and focused on the island of Hawaii, where much of the state's landscaping industry is located and where long-term forest monitoring plots have been established in collaboration with USDA Forest Service IPIF. (Samples from Kauai and Oahu were also submitted during the survey.)

RESULTS

The survey targeted plants in Myrtaceae (the family that *Puccinia psidii*'s host range is restricted to) looking primarily at plants in nurseries and botanical gardens. Recently harvested eucalyptus plantations were added to the list of sites to be surveyed (immature eucalyptus foliage such as stump sprouts are susceptible to disease). Of all the plants surveyed in the project, rust was found on 4 previously undocumented hosts. Two of these detections were on uncommon nursery species. The other two were on eucalyptus forestry species in recently disturbed stands.

In addition to the host range survey, plots established in ohia forests around the island were monitored. One unusually severe infestation was found on a young tree at Keauohana Forest Reserve and a sample was submitted to UH (see Figure 1). The monitoring plots were established to monitor impacts to forest from *P. psidii*, and the results from this study will be published by the USDA Forest Service.

When unusual infections (high severity or new host) were detected, samples were sent to UH. Scientists there confirmed identification of the disease. In addition, attempts were made to collect live spores to conduct inoculations trials on a suite of known susceptible and non-susceptible species. These inoculation tests can indicate a new biotype present in Hawai'i or a shift in host range by the existing strain if results differ from previous trials. At the time of the writing of this report, only the sample from an unusually severe infestation on 'ōhi'a had gone through this host range testing. The results found no variation from previous trials.

Collection of live spores from the eucalyptus samples was unsuccessful. Infected eucalyptus is concerning because the eucalyptus biotype is not known to occur in Hawaii. However the infestations were not severe and follow up surveys to collect samples have not found rust present.

Measures of Success:

Samples Submitted to UH laboratory:

- Approximately 87 samples collected from 27 different host plant species were submitted to Dr. Janice Uchida's lab for identification and host range testing.

New Host Species Documented:

1. *Eucalyptus grandis*. On young coppice tissue on Hawaii island in Paauhau and Niupea areas.
2. *Eucalyptus saligna*. On coppice, Kauai in the Kokee burn area.
3. *Eugenia stipitata*. Hawaiian Paradise Park nursery, in ground plant. Infection was mild.
4. *Myrcia sphaerocarpa*. Hawaiian Paradise Park nursery, in ground plant. Infection was mild.

Number of host species surveyed:

- 62 species and hybrids

Table 1. Documented Host Species of *Puccinia psidii* in Hawaii

Prepared by Dr. Janice Uchida and Chris Kadooka, University of Hawaii

Scientific Name	Common Name
<i>Calistemon citrinus</i>	Bottle Brush
<i>Calistemon viminalis</i>	Weeping Bottle Brush
<i>Chamelaucium uncinatum</i>	Wax Flower
<i>Eucalyptus cinerea</i>	Argyle apple
<i>Eucalyptus grandis</i>	Rose gum
<i>Eucalyptus gunnii</i>	Cider gum
<i>Eucalyptus kruseana</i>	Book-leaf mallee
<i>Eucalyptus saligna</i>	Sydney blue gum
<i>Eugenia coronata</i>	
<i>Eugenia koolauensis</i> (H)	Nioi
<i>Eugenia palumbis</i>	Agatelang
<i>Eugenia reinwardtiana</i> (H)	Nioi/Beach cherry
<i>Eugenia stipitata</i>	
<i>Eugenia uniflora</i>	Surinam cherry
<i>Eulacypus resinifera</i>	Red Mahogany
<i>Melaleuca quinquenervia</i>	Paperbark
<i>Metrosideros excelsa</i>	Pohutukawa
<i>Metrosideros kermadecensis</i>	Kermadec pohutukawa
<i>Metrosideros polymorpha</i> (H)	ōhi'a lehua
<i>Metrosideros tremuloides</i> (H)	ōhi'a lehua
<i>Myrcia sphaerocarpa</i>	
<i>Myrciaria cauliflora</i>	Jaboticaba
<i>Myrtus communis</i>	True myrtle
<i>Pimenta dioica</i>	Allspice
<i>Pimenta racemosa</i>	Bay Rum Tree
<i>Rhodomyrtus tomentosa</i>	Downy rosemyrtle
<i>Syncarpia glomurifera</i>	Terpentine tree
<i>Syzygium aromaticum</i>	Clove
<i>Syzygium aquaeum</i>	Watery Rose Apple
<i>Syzygium cumini</i>	Java plum
<i>Syzygium gracilipes</i>	

<i>Syzygium jambos</i>	Rose apple
<i>Syzygium malacense</i>	Mountain apple
<i>Syzygium megacarpum</i>	Giant Lau Lau
<i>Syzygium paniculatum</i>	Australian brush cherry
<i>Syzygium samarangense</i>	Wax Apple
<i>Syzygium sandwicensis (H)</i>	Ohia ha
<i>Xanthostemon chrysanthus</i>	Golden Penda

(H) = indigenous to Hawaii

Figure 1. Moderately infected 'ōhi'a at Keauohana Forest Reserve

Photo by Aileen Yeh



Appendix 1.
List of Species Surveyed

Acca sellowiana	Leptospermum petersonii
Callistemon citrinus	Leptospermum scoparium
Callistemon spp. Groovy bark?	Leptospermum vigatum
Callistemon "Little John"	Lophostemon conferta
Callistemon viminalis	Melaleuca alterniflora Tea oil tree)
Callistemon viminalis Scarlet flame, Slim	Melaleuca quinquenervia/ leacadendra
Callistemon viminalis Firescape	Metrosideros excelsa
Callistemon pinifolius - green and red	Metyrosideros kermadensis
Callistemon salignus	Metrosideros polymorpha pubescent
Callistemon salignus hybrids	Metrosideros polymorpha glabrous
Callistemon violaceus	Metrosideros polymorpha hybrid
Eucalyptus cinerea	Myrcia sphaerocarpa
Eucalyptus citriodora	Myrciaria cauliflora
Eucalyptus deglupta	Myrciaria glomerata/Plinia glomerata
Eucalyptus dunnii	Myrciaria vexator
Eucalyptus grandis	Myrtus communis
Eucalyptus gunnii	Pimenta dioica
Eucalyptus kruseana	Psidium cattleianum var. yellow
Eucalyptus microcorys.	Psidium cattleianum var. red
Eucalyptus pulverulenta (Baby Blue)	Psidium angulatum
Eucalyptus robusta	Psidium friedrichsthalianum
Eucalyptus nicholii	Psidium guajava - common
Eucalyptus polyanthemus	Psidium guajava var. large leaf form
Eucalyptus robusta	Psidium guajava var. small leaf form
Eucalyptus saligna	Psidium guajava 'Purple'
Eucalyptus sideroxyton	Psidium guajava 'Siam Seedless'
Eugenia spp. Big leaves	Psidium guajava Ruby x Supreme
Eugenia sp - Compacta	Psidium White pear guava
Eugenia brasiliensis	Psidium guineense
Eugenia francavilleana	Rhodomytus tomentosa
Eugenia myrtifolia	Syzygium aqueum Alst.
Eugenia myrtifolia "Compacta"	Syzygium aromaticum
Eugenia myrtifolia - Monterey Bay	Syzygium cumini
Eugenia paniculatum = Syzygium paniculatum	Syzygium jambos
Eugenia paniculatum "upright"	Syzygium luehmannii
Eugenia subterminalis	Syzygium malaccense var. Alba
Eugenia stipitata	Syzygium malaccense var. Red
Eugenia uniflora	Syzygium malaccense var. Thai
Eugenia victoriana	Syzygium megacarpum
Laevigatum petersonii	Syzygium samarangense
	Xanthostemon chrysanthus(yellow)
	Xanthostemon chrysanthus(red)