The #OhiaLove Project: Banking Seeds of a Hawaiian Keystone Species During the Rapid ʻŌhiʻa Death Crisis

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Matthew Keir, Laukahi Hawai‘i Plant Conservation Network
Jill Wagner, Hawai‘i Island Seed Bank
Rarity of the Hawaiian Flora

- ≈90% endemism in flowering plants
- ≈30% federally listed or candidate
- >40% of U.S. listed plants from HI
- 10% of flora presumed extinct
- 235 taxa with <50 individuals remaining in the wild
ʻŌhīʻa Lehua (*Metrosideros polymorpha*)

- Endemic to the Hawaiian Islands
- Dominant forest tree covering nearly 1 million acres statewide, from sea level to >9000’ (2700m) elevation
- Among first plants to colonize new lava flows
ʻŌhiʻa Lehua (*Metrosideros polymorpha*)
ʻŌhiʻa Lehua (*Metrosideros polymorpha*)
‘Ōhi‘a Lehua (*Metrosideros polymorpha*)
ʻŌhīʻa Lehua (*Metrosideros polymorpha*)

Hawaii DLNR

AP

Google

[Image of flowers and leaves]

[Image of a person wearing a haku of flowers]

[Image of a bird and flowers]

[Image of a snail on a branch]

[Image of various floral arrangements]
O‘ahu Endemic *Metrosideros*

- *Metrosideros macropus*
- *Metrosideros tremuloides*
- *Metrosideros rugosa*
Rapid ʻŌhīʻa Death

- Fungal pathogen *Ceratocystis fimbriata* (likely undescribed species)
- Kills trees within days or weeks of first symptoms
Affecting >47,000 acres
Some tolerance or resistance, but mortality increased with repeated surveys in some areas
For more info: rapidohiadeath.org
Rapid ʻŌhiʻa Death
Rapid ‘Ōhi’a Death

Vectors
• Airborne sawdust from bark-boring beetles
• Humans & their gear, equipment, vehicles

Preventive Actions
• Quarantine on inter-island movement
• Outreach to reduce spread of ROD via sanitation protocols
Rapid ‘Ōhi’a Death

RAPID ‘ŌHI’A DEATH
PART I: STRATEGIC RESPONSE PLAN
STRATEGIC RESPONSE PLAN SUB-COMMITTEE
NOVEMBER, 2016

Research

Outreach

Education

TIVIALAN ENDEMIC HAWAIIAN HONEYCREEPER ON ‘ŌHI’A MANO (DAN CLARK PHOTO)
Seed Banking in Response to ROD

Seed Conservation Laboratory – Hawaiian Rare Plant Program

In the Seed Lab, over 13 million seeds are banked, representing more than 550 taxa of native Hawaiian plants, or about 40% of the flora. Of these, over half are federally listed as endangered. The Seed Lab partners with Lyon’s Micropropagation Lab, the Plant Extinction Prevention Program (PEPP), the Department of Forestry and Wildlife (DOFAW), and other agencies to provide for both long-term storage – preservation of genetic diversity – and propagation of plants for restoration efforts. We also conduct original research on seed characteristics such as storage behavior, longevity, dormancy, and germination.
Seed Banking in Response to ROD
Seed Banking in Response to ROD

*Erythrina sandwicensis*

*Metrosideros polymorpha*
Seed Banking in Response to ROD

- Lisa Keith at USDA Pacific Basin Agricultural Research Service conducting ROD pathology research
- Trials showed seeds are unlikely to carry *Ceratocystis* and seed drying protocols likely kill fungal spores
#OhiaLove Crowdfunding Campaign

Seeding the future of the 'ōhi'a forest from University of Hawai'i System

$50,030 of $50k goal
Raised by 457 people in 4 months
Donate Now
Share on Facebook

#OhiaLove Help Save Hawai'i Forests

Reward Levels
#OhiaLove Crowdfunding Campaign

Seeding the future of the ʻōhiʻa forest
from University of Hawaiʻi System

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Donate Now

#OhiaLove Help Save Hawaiʻi Forests

457 donations
>4000 social media shares
Hawai‘i Seed Bank Partnership
Laukahi – Hawai‘i Plant Conservation Network

- Created to coordinate seed banking efforts statewide
- Administered by Laukahi, which facilitates collaboration in plant conservation efforts statewide
- Began in 2013 with four active seed banks
Hawai‘i Seed Bank Partnership
Laukahi – Hawai‘i Plant Conservation Network
Established in 2008 by Jill Wagner, HSBP founding member

Now a critical partner in the #OhiaLove Project – funds helped purchase dedicated equipment for ʻōhiʻa seeds to reduce risk of spreading ROD from Hawaiʻi Island
State of Hawaiʻi Division of Forestry & Wildlife
Kauaʻi Seed Bank

• Established in 2014 by Adam Williams, Kauaʻi Botanist
• Collection partner in the #OhiaLove Project – funds supported backup storage of ʻōhiʻa seeds from Kauaʻi at Lyon Arboretum, including 2 island-endemic taxa
ʻŌhiʻa Collection Strategy

- HSBP partners developing provisional seed zones on each island
- Laukahi developing seed collection targets, statewide goals, and data management
- Lyon Arboretum developing standardized seed collection and post harvest handling protocols
ʻŌhiʻa Collection Protocols

- Seed maturity guidelines
- Post-harvest ripening & handling protocols
- Standardized data required (e.g. variety, GPS, # capsules)
#OhiaLove Collection Summary
2016

- Over 2 million seeds from over 85 trees
- 10 seed zones on O‘ahu and Hawai‘i Island
- Taxa collected:
  - *Metrosideros polymorpha*
    - var. incana, glaberrima, newellii, polymorpha
    - hybrids *incana x glaberrima, incana x polymorpha*
  - *Metrosideros macropus*
  - *Metrosideros rugosa*
  - *Metrosideros tremuloides*

- Over 700,000 seeds banked at Lyon as backup for Kaua‘i collections, including taxa:
  - *M. polymorpha* var. glaberrima, polymorpha, pumila
  - *Metrosideros waialealae*
#OhiaLove Collection – Hawai‘i
South Kona – May 2016

Taxa collected this trip: *Metrosideros polymorpha* varieties *incana*, *glaberrima*, *polymorpha*
hybrid *incana x glaberrima*
#OhiaLove Collection – Hawai‘i
Wailuku Stream – May 2016

Taxa collected this trip:
*Metrosideros polymorpha*
variety *newellii*
#OhiaLove Collection – O‘ahu
Koʻolau Summit – June 2016

Taxa collected this trip: 
*Metrosideros rugosa*
#OhiaLove Collection – O‘ahu
Wai‘anae Mountains – August 2016

Taxa collected this trip:
Metrosideros polymorpha
variety polymorpha
hybrid incana x glaberrima
ʻŌhiʻa Collection Strategy

<table>
<thead>
<tr>
<th># ʻŌhiʻa TAXA</th>
<th># TREES</th>
<th># CAPSULES</th>
</tr>
</thead>
<tbody>
<tr>
<td>14 Including varieties</td>
<td>10,000 trees per taxon Representing all populations statewide</td>
<td>Minimum: 25 (5,000 seeds) Maximum: 75 (15,000 seeds)</td>
</tr>
<tr>
<td>TOTAL</td>
<td>140,000 trees</td>
<td>700 Million – 2.1 Billion Seeds!</td>
</tr>
</tbody>
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laukahi.org
Rapid 'ōhi'a Death [RAPIDOHIADEATH.ORG](https://RAPIDOHIADEATH.ORG) is killing thousands of acres of trees on Hawai‘i Island.

Research is ongoing on the cause, prevention, and treatment of this new threat to our forests.

Collections of 'ōhi'a seeds must be urgently secured for future restoration efforts.

A partnership of Hawai‘i’s seed banks and conservation groups is working to collect seeds.

Please use the links above for more information.
Next Steps:
ROD Seed Banking Initiative
2017-2018

• Expand by offering ‘ōhi‘a seed collection workshops on each island, asking for help from conservation agencies and the local community
• Funding secured for Hawai‘i Seed Bank Partnership facilities to accept ‘ōhi‘a seeds from many sources
• Provide material for USDA and University of Hawai‘i research into ROD resistance
• Bank seeds of rare species affected by ROD
Mahalo! (Thank You)

Tim Kroessig
Jill Wagner
Matt Keir
Keoni Kīkala
Hawaiʻi Seed Bank Partners

Funding Sources
#OhiaLove Supporters
UH President David Lassner
Hawaiʻi Tourism Authority

UH Mānoa Office of Communications, Nellie Sugii, Lyon Arboretum Staff, Friends of Lyon Arboretum, UH Foundation

JB Friday, Flint Hughes, Lisa Keith, Ardena Saarinen, Kainana Francisco, Adam Williams, Puʻu Waʻawaʻa Staff, and the ROD Working Group
ʻŌhiʻa Lehua (*Metrosideros polymorpha*)
Guidelines for Landowners

PDF posted at laukahi.org and shared on Lyon Arboretum’s Facebook page

Landowner’s Guide to Storing ‘Ōhi’a Seeds

Please do not collect ‘ōhi’a seeds in the forest! It could be harmful to these natural populations of trees, and even worse, it increases the likelihood that you will spread Rapid ‘Ōhi’a Death.

How to store ‘ōhi’a seeds from your own land:

1. Collect ripe, healthy seeds
2. Extract and clean the seeds
3. Germinate some seeds
4. Dry the seeds for storage
5. Package the seeds for storage
6. Store the seeds
7. Test seeds from time to time
8. Prepare stored seeds for sowing
9. Sow the seeds & grow ‘ōhi’a!

Read on for details on each step
The preceding presentation was delivered at the

2017 National Native Seed Conference
Washington, D.C. February 13-16, 2017

This and additional presentations available at http://nativeseed.info