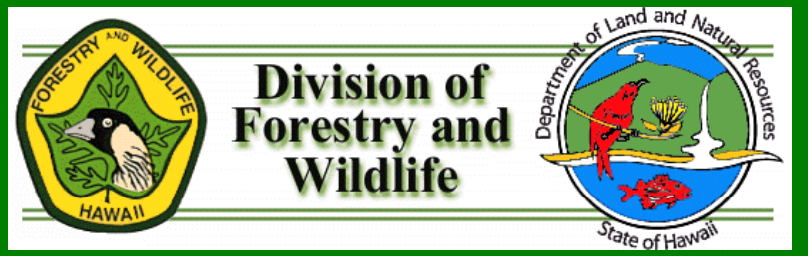
Rare Plant Stabilization on O`ahu, Hawai`i

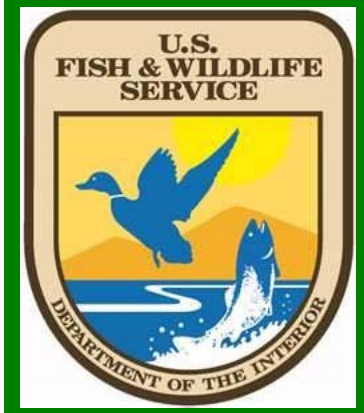
Matthew Keir

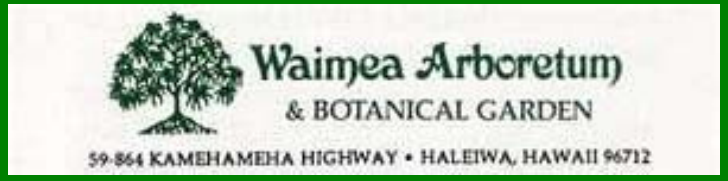
Lauren Weisenberger

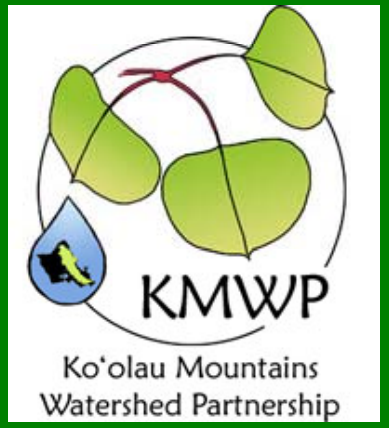
O`ahu Army Natural Resource Program

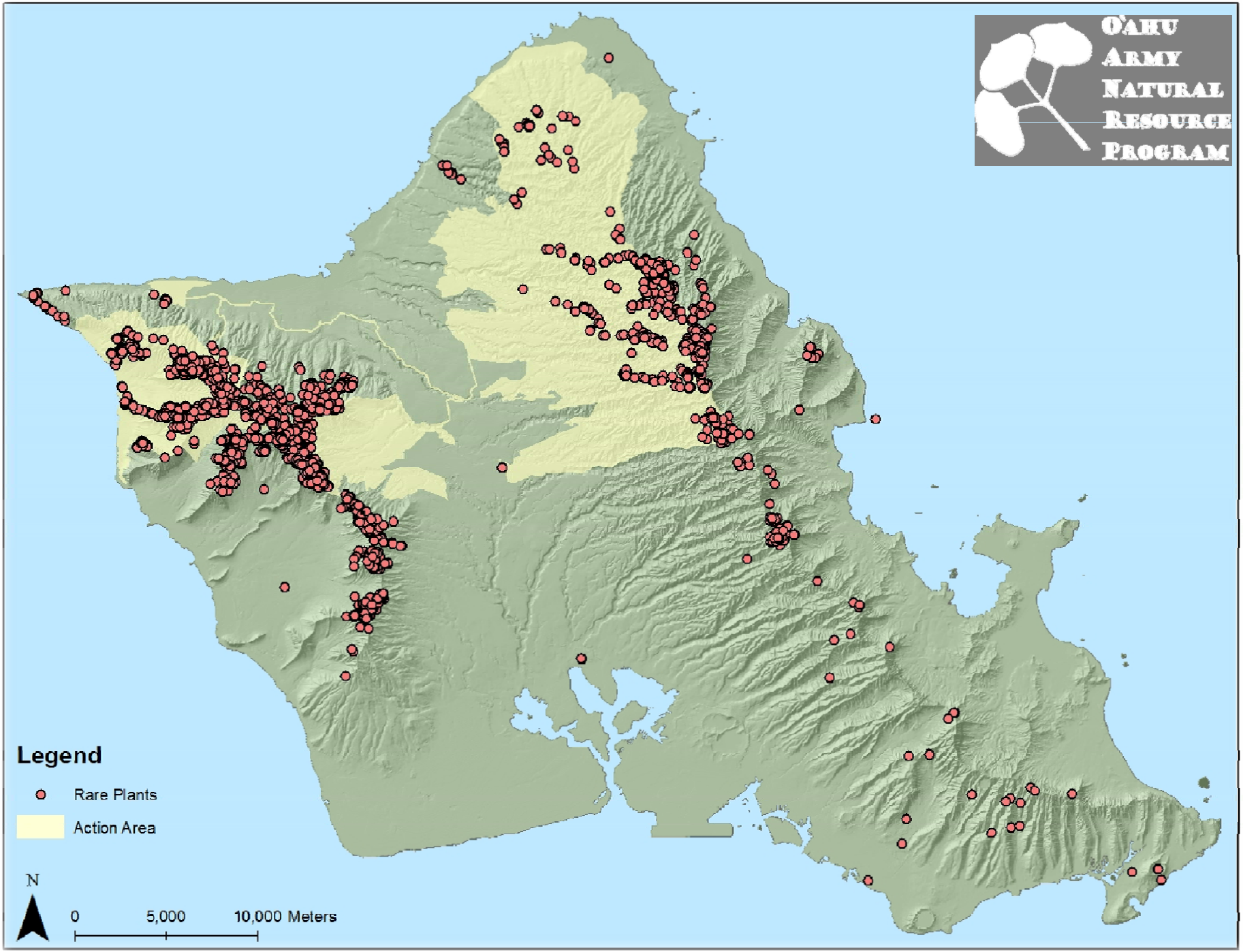
Conservation Partners










O'AHU
ARMY
NATURAL
RESOURCE
PROGRAM
Legend
Rare Plants
Action Area
N
0
5,000
10,000 Meters

Stability Goals

1. Minimum # of population units
2. Minimum # of mature plants
3. Stable population structure
4. All populations in genetic storage
5. All known threats controlled

Reporting & Data needs

counts: # populations & # plants

demographic structure: population trends

genetic storage: founder tracking

Adaptive Management

measure outplanting success

Biological Variables used in Planning

Determined minimum # of plants:

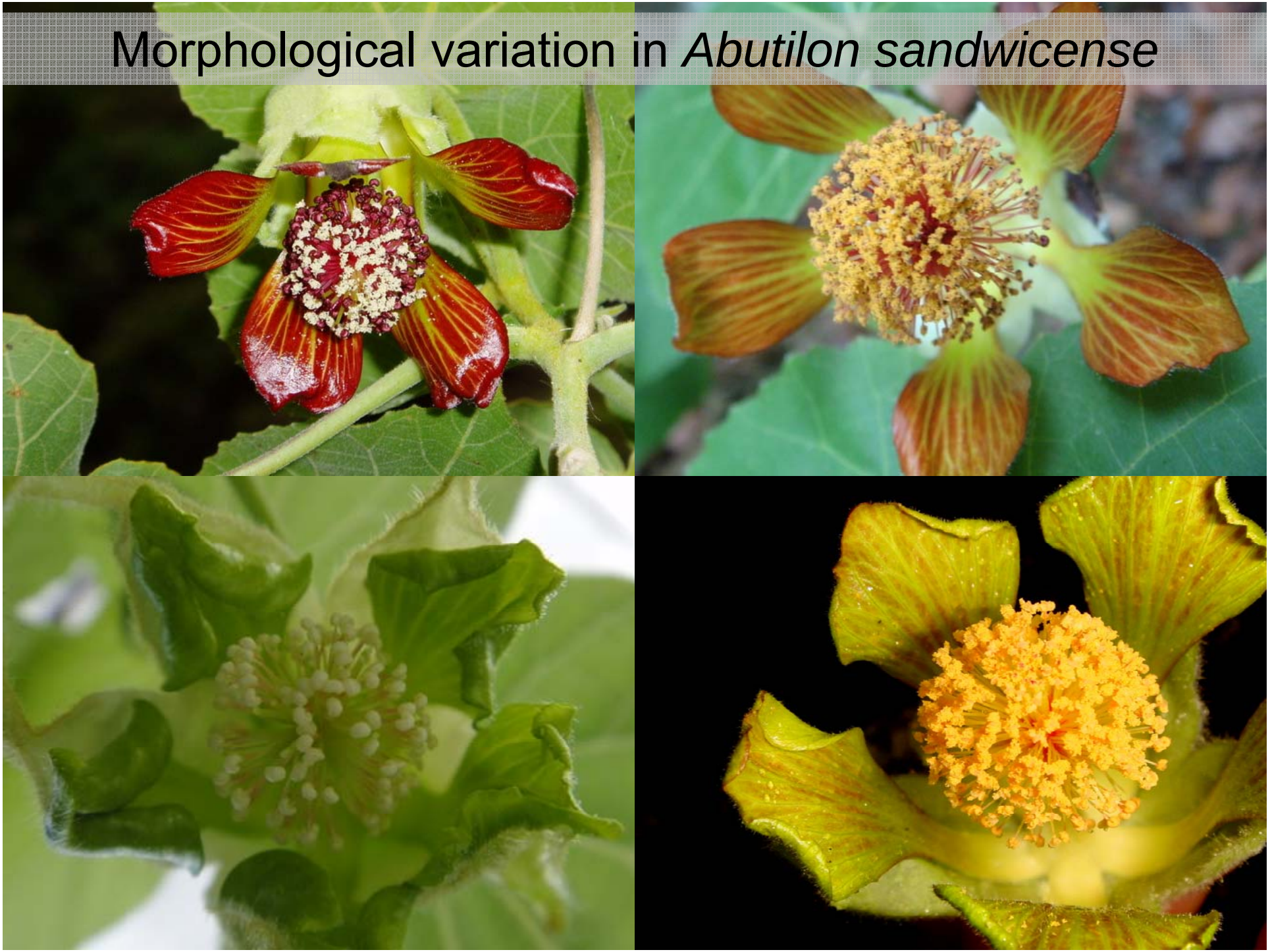
Life span: long-lived vs. short-lived
Mating & breeding system
Seed bank persistence
Population trends
Inconsistent flowering

Delimited population units:

Pollination biology
Results from genetic testing
Geography
Land ownership

Took a conservative approach to preserving genotypes of individuals

Morphological variation in *Abutilon sandwicense*




SCHIEDEA KAALAE
A080512009 #1-10
SCHIEDEA KAALAE
EKA-A
#1, 3-8
D20

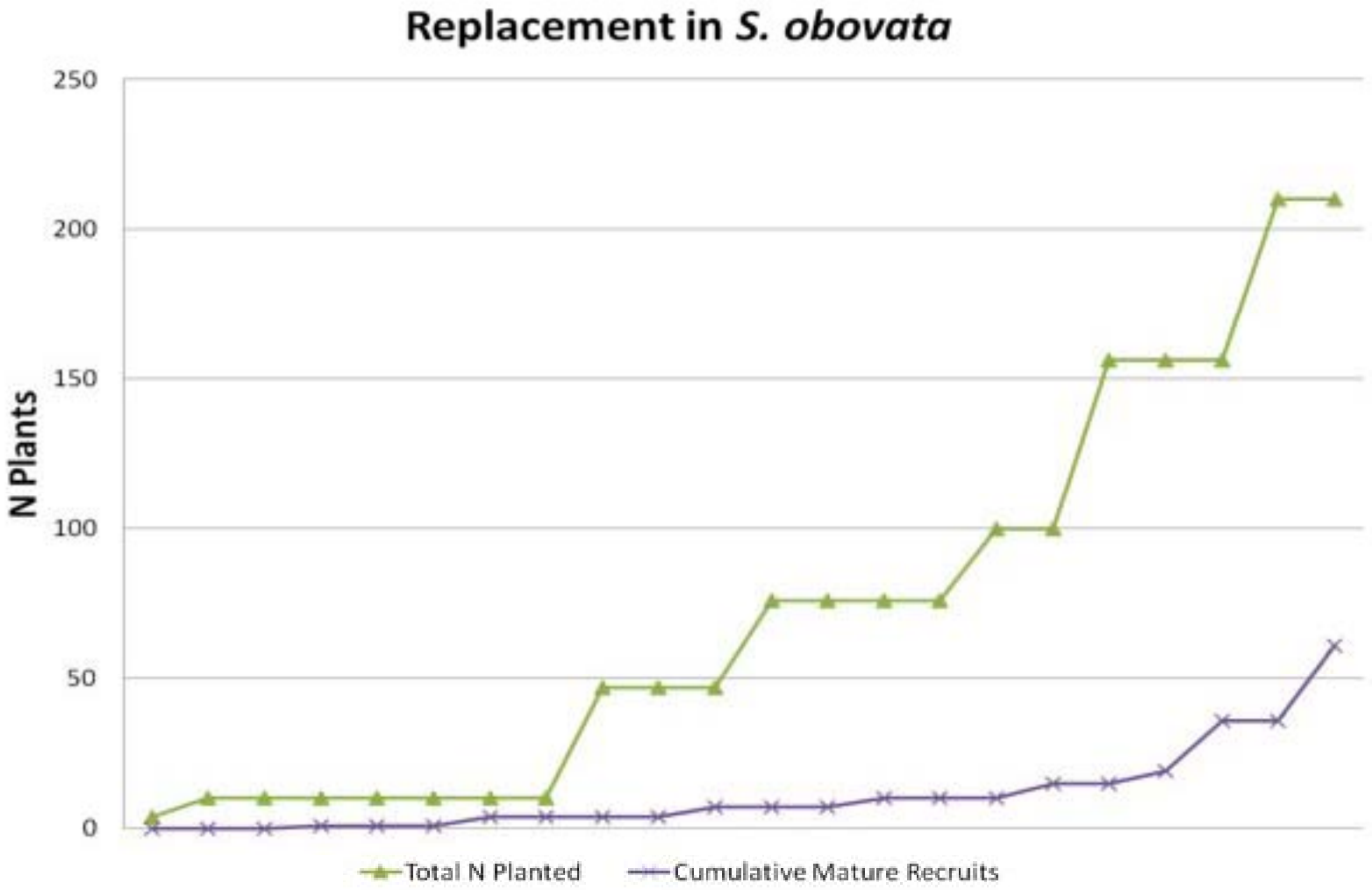
MMR-A-0001

Balancing founders at outplanting sites and in ex situ genetic storage

Founder Plant Num	Plant Collected?	Founder Dead?	Number of Propagules Available:	Founder			All Reintro Pops from Founder		
				Founder Microprop	Founder Seeds	Num @ Army Nurseries	Reintro Seeds	Reintro Microprop	Reintro ArmyNurs
0008	**Y**	**Dead**		0	5114	1	729	0	3

ReintroTaxonCode PopRefSiteID	ReintroTarget PopRefSite Name	Target Number for Reintro	Num of Plants Reintro Attemp	Num of Plants Dead	+ (More Need) - (Over Goal)	**Plants Needed**
SchObo.PAH-D	Pahole REINTRO below snail exclosure	**33**	34	1	**0**	**0**
Total for Plant Number:	**0008**	**33**	**34**	**1**		**0**
Total PopRef Site:	**SchObo.PAH-C**	**66**	**59**	**6**		**13**

Database links founder to outplanted progeny and all ex situ genetic storage collections



1999 → 2011

GREEN= Total number of outplants

PURPLE= Total number of mature progeny (F1)

Rare Plant Management Tools

Oahu Army Natural Resource Program

Seed storage: re-collection intervals

Vegetative propagation: cloning

Low seed set: hand-pollination

Outplanting: transport and planting techniques

Seed Storage

Superior form of ex situ genetic storage

1.preserves most genetic diversity
2.least amount of space & energy
3.most likely to withstand natural disaster

"When the climate changes and human disturbances bring tremendous threats to vegetation and the environment, it is seeds that confer on us a great hope to maintain a bright future."
Dr. Xingguo Han, Chair, Seed Ecology IV

Seed Storage

Long-term Purposes:

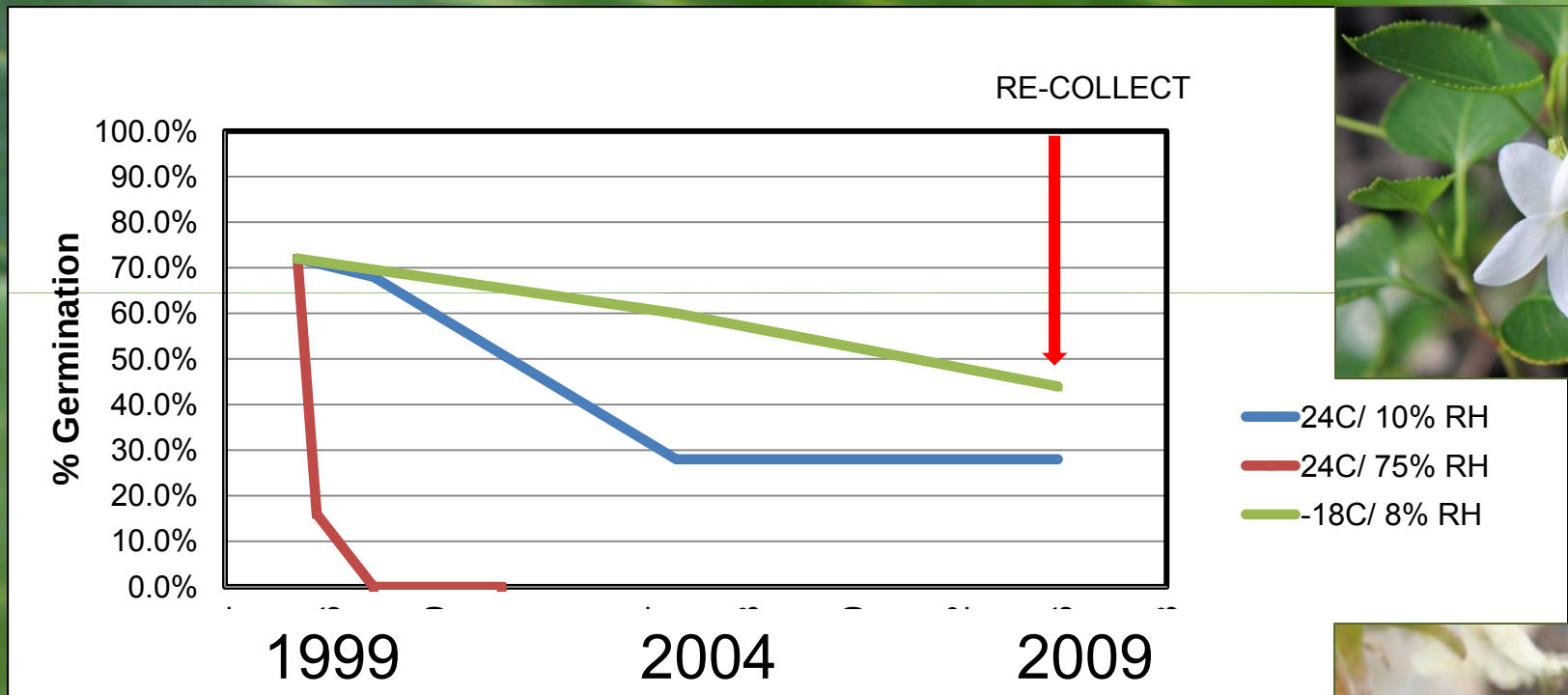
1.backup outplantings
2.replace individuals lost to catastrophe

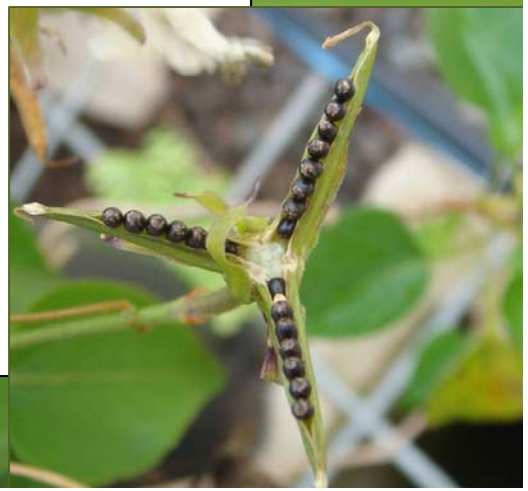
Short-term Purposes:

1. hold while threat control begins
2. propagation & storage research
3. accumulate founders for large, genetically diverse outplantings

Germination of Fresh & Stored Seeds of *Viola chamissoniana* Ging. subsp. *chamissoniana* (Violaceae)

O'AHU ARMY NATURAL RESOURCE PROGRAM





Once a decline in viability is detected, the re-collection interval is set for that length of storage time.

Taxa in storage	Years without decline in viability
Cyanea crispa	≥10
***Cyanea grimesiana* subsp. *obatae* ***	**10**
Cyanea superba subsp. *superba*	≥15
***Cyrtandra dentata** *	**10**
Delissea waianaeensis	≥15
Dubautia herbstobatae	≥15
Euphorbia celastroides var. *kaenana*	≥5
***Flueggea neowawraea** *	**10**
Hibiscus brackenridgei subsp. *mokuleianus*	≥10
Kadua parvula	≥10
***Lobelia koolauensis** *	**10**
Melanthera tenuifolia	≥10
Neraudia angulata	≥10
***Sanicula mariversa** *	**10**
Schiedea kaalae	≥10
Schiedea nuttallii	≥10
Schiedea obovata	≥15
Schiedea trinervis	≥15
Tetramolopium filiforme	≥15
***Viola chamissoniana* subsp. *chamissoniana**	**10**

O'ahu Army Natural Resource Program

Securing Propagules

Timing, phenology, logistics & luck

Fruitless Efforts = Vegetative Propagules

Cuttings:
Abutilon
Cenchrus
Eugenia
Eurya
Flueggea
Gardenia
Huperzia
Melanthera
Melicope
Neraudia
Nototrichium
Phyllostegia
Schiedea
Stenogyne
Tetramolopium
Viola

Divisions:
Cenchrus
Phyllostegia
Stenogyne

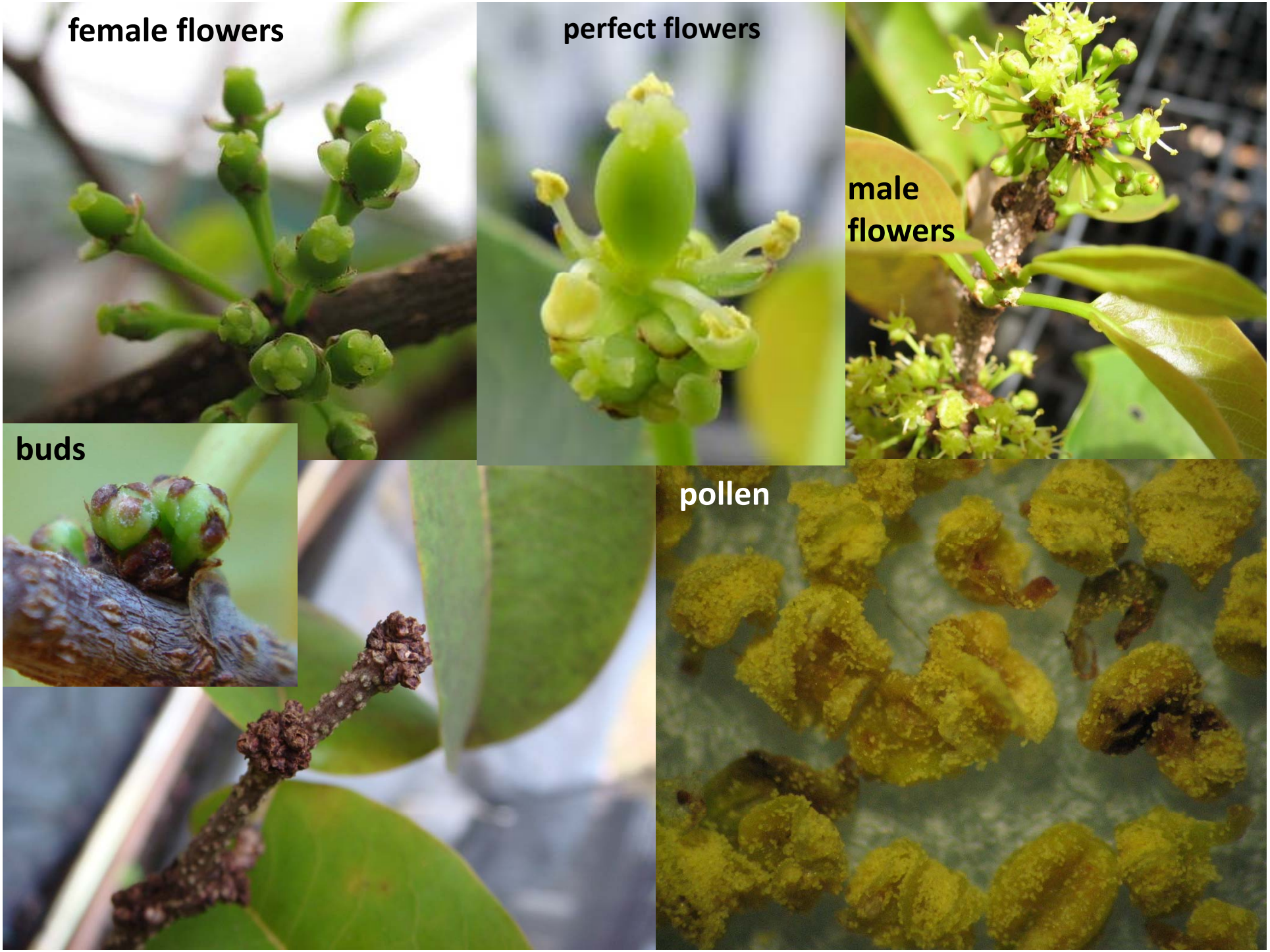
Grafting:
Flueggea
Hibiscus

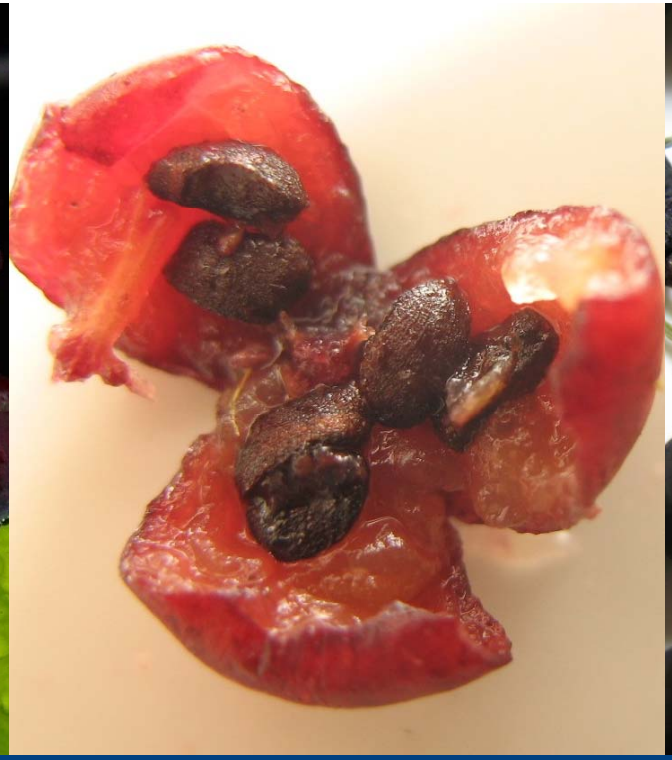
Air-layer:
Abutilon
Alectryon
Eugenia
Flueggea
Gardenia
Hesperomannia
Hibiscus
Labordia
Urera

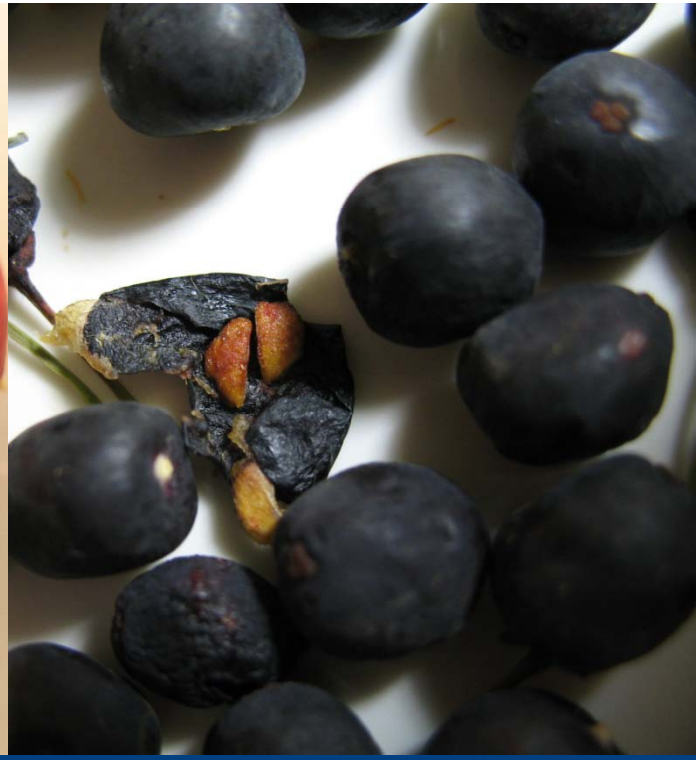
Vegetative propagation for rapidly increasing stock for outplanting and to limit generations in cultivation

Flueggea neowawraea

Air-layers and cuttings collected off wild trees & established in the nursery


female flowers
perfect flowers
male flowers
buds
pollen





SEEDLINGS

OUTPLANTED SAPLINGS

Reduced or absent seed set

Dioecious taxa:

Flueggea neowawraea
Gardenia mannii
Labordia cyrtandrae

Presumed avian pollinator absent on O`ahu for:

Cyanea sp.
Hesperomannia sp.
Lobelia sp.


Labordia cyrtandrae


Cyanea grimesiana* subsp. *obatae

Labordia cyrtandrae


Labordia cyrtandrae

Hand Pollination


Loss of avian pollinators and reduced seed set?
©williamweaverphotography

Cyanea superba subsp. *superba*

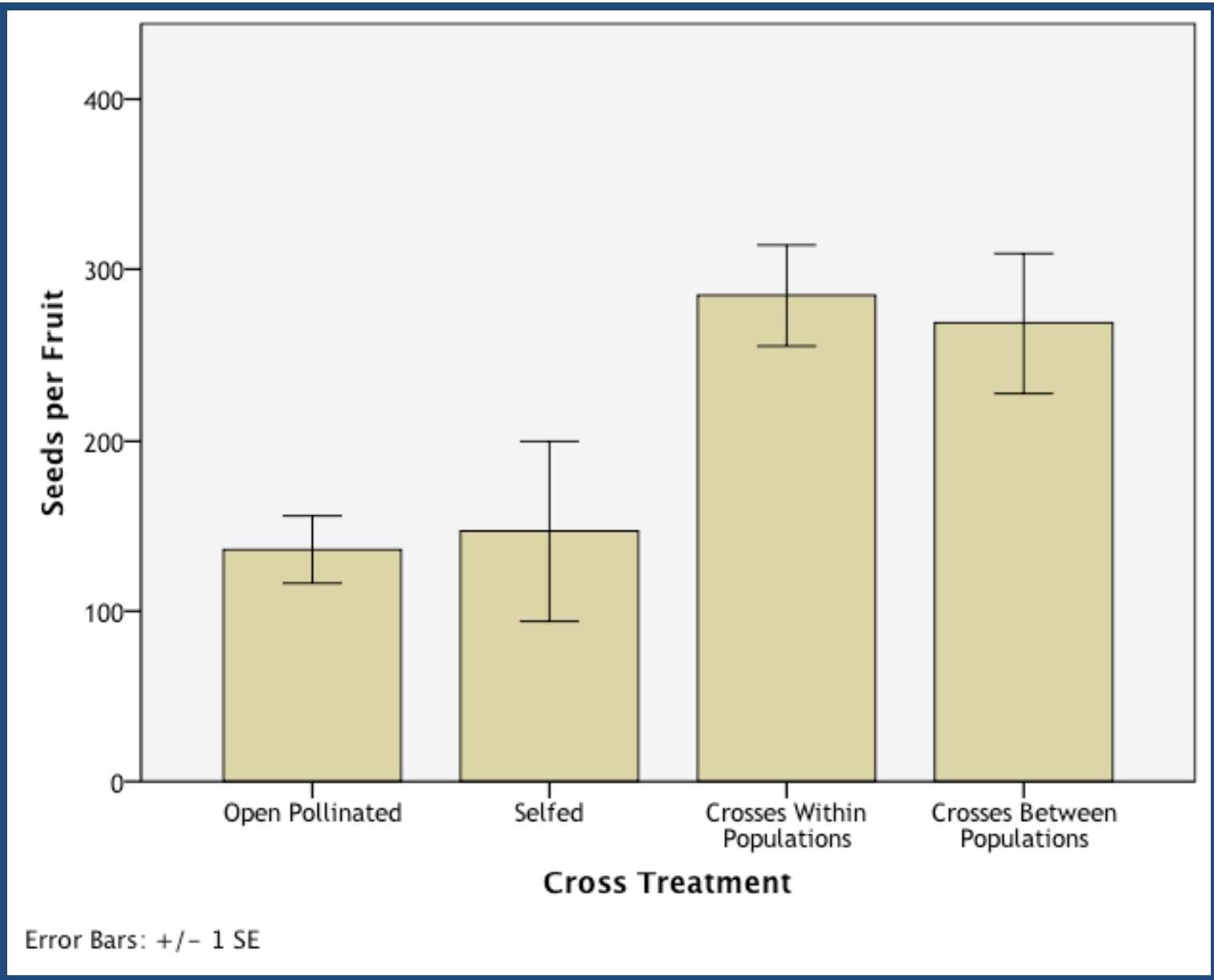
Seedlings under outplants

Mature Fruit

Cyanea superba subsp. *superba*


Cyanea st.-johnii


Cyanea st.-johnii



Cross treatment marginally affected the number of seeds per fruit (GLM1, F = 2.957, df = 3, p = 0.054). Hand pollinating increases the number of seeds a fruit produces in comparison to open pollinated fruit (t = 3.45, df = 25, p = 0.002).

Outplanting

Nursery sanitation

Plant transport

Outplanting


Mahalo
Hesperomannia oahuensis ☺