Are We Targeting Hawaii's Endangered Plants For Extinction?

Bruce P. Koebele
Ka`ala Farm, Inc.
“I’m not a population geneticist. But I did stay at a Holiday Inn Express last night.”
“…. A minimum total of 3 populations of each taxon …. with a minimum of 25 mature individuals per population for long-lived perennials …. And a minimum of 50 mature individuals per population for short-lived perennials ….” (Recovery Plan for the Oahu Plants, US Fish & Wildlife Service, 1998)

“The Hawaii and Pacific Plants Recovery Coordinating Committee (HPPRCC) (1994) recommended stability goals as three populations of plants with a minimum of either 25 mature and reproducing individuals of long-lived perennials (>10 year life span), 50 mature and reproducing individuals of short-lived perennials (<10 year life span) or 100 mature and reproducing individuals of annual taxa per season (<1 year life span).” (Mäkua Implementation Plan, US Army Garrison Hawaii, 2003)

“Measurable Long-Term Success Criteria
(1) At least 80 reproducing adult plants will be present in each population, averaged over a five-year period after irrigation is ceased.” (Habitat Conservation Plan for Abutilon menziesii at Kapolei; State of Hawai‘i Department of Transportation, 2004)
Effective population size ($N_e$): The number of individuals that would result in the same inbreeding or genetic drift if they behaved in the manner of an idealized population.

Frankham 1995
How does a small $N_e$ affect the population?

Frankham et al. 2002

after Foose 1986

after Parkin 1979
But are these effects detrimental? **Yes, they are!**

Frankham et al. 2002

Barrett & Kohn 1991
So, what should we do?

- Increase stabilization targets by at least ten-fold.
This is exactly what **WE** did for *Achyranthes splendens* var. *rotundata* at the USFWS Kalaeloa Unit.
So, what should we do?

- Increase target values.
- **Restrict the use of the term “population” to demonstrated genetic entities.**

“At the time of listing, 1,500 to 3,000 individuals of *Nototrichium humile* were known in 11 populations on Oahu and one on Maui.”


“At the time of listing, *Pritchardia kaalae* was known from five populations in the northern Waianae Mountains of Oahu, with a total of 130 wild individuals.”

So, what should we do?

- Increase target values.
- Restrict use of “population.”
- Determine the genetic diversity of endangered Hawaiian plant species.

“Both RAPD and ITS sequence analysis indicate that populations of *C. skottsbergii* var. *skottsbergii* on Oahu and Molokai are genetically distinct, and the extent of this genetic differentiation supports the recognition of these populations as distinct varieties.” (Population Variation and Phylogeny in the Endangered Chamaesyce skottsbergii [Euphorbiaceae] Based on RAPD and ITS Analyses, Morden & Gregoritza, 2005)
In contrast:

“We (Morden, Sherwood & Birch) did some work on *Gossypium* and found that ‘populations’ on different islands (not just parts of the same island) are **genetically indistinguishable**. Thus, the entire species among the islands is likely a metapopulation rather than distinct different populations.” (Morden, personal communication, 2008)
So, what should we do?

- Increase target values.
- Restrict use of “population.”
- Determine genetic diversity.
- Use artificial migration to reestablish gene flow between isolated plant clusters.

after Heschel & Paige 1995

Dudash 1990
Acknowledgements:
I would like to thank Cliff Morden (Professor of Botany, University of Hawai`i at Mānoa) for his help with this presentation.