

5-YEAR REVIEW

Short Form Summary

Species Reviewed: *Solanum incompletum* (Popolo ku mai)

Current Classification: Endangered

FR Notice announcing initiation of this review:

U.S. Fish and Wildlife Service (USFWS). 2006. Endangered and threatened wildlife and plants; initiation of 5-year reviews of 70 species in Idaho, Oregon, Washington, Hawaii, and Guam. Federal Register 71(69):18345-18348.

Lead Region/Field Office:

Region 1

Pacific Islands Fish and Wildlife Office, Gina Shultz, Assistant Field Supervisor
Endangered Species

Name of Reviewer(s):

Marie Bruegmann, Pacific Islands Fish and Wildlife Office, Plant Recovery Coordinator
Marilet A. Zablan, Pacific Islands Fish and Wildlife Office, Recovery Program Leader
and Acting Assistant Field Supervisor for Endangered Species

Methodology used to complete this 5-year review:

This review was based on the final critical habitat designation for *Solanum incompletum* and other species from the island of Hawaii, as well as a review of current, available information. The National Tropical Botanical Garden, subcontracted by the Hawaii Biodiversity and Mapping Program, provided an initial draft of portions of the 5-year review.

Background:

For information regarding the species listing history and other facts, please refer to the Threatened and Endangered Species System (TESS) which is part of the Fish and Wildlife Service's Environmental Conservation On-line System (ECOS) database.

Application of the 1996 Distinct Population Segment (DPS) Policy:

This Policy does not apply to plants.

Review Analysis:

Please refer to the final critical habitat designation for *Solanum incompletum* published in the Federal Register on July 2, 2003 (USFWS 2003) for a complete review of the species' status (including biology and habitat), threats, and management efforts. No new threats and no significant new information regarding the species biological status have come to light since listing to warrant a change in the Federal listing status of *S. incompletum*.

At the time of listing, only two individuals were known on the island of Hawaii, although historically *Solanum incompletum* also occurred on Kauai, Maui, Lanai, and Molokai (USFWS 1994). Currently, 53 mature and 20 immature individuals remain in the one last

naturally occurring population in the U.S. Army's Pohakuloa Training Area. An additional 10 individuals were found at Puu Waawaa in 2007 (USFWS 2007). Outplanting of *S. incompletum* began in 2002. In the last five years 1,084 individuals have been planted at seven sites. Overall survival is 85 percent, with 849 of the 1,003 planted between 2002 and 2005 remaining. Natural recruitment was noted for the first time during 2006. Individuals at upper elevation sites are susceptible to frost damage (U.S. Army Pohakuloa Training Area 2006). Outplanting locations and numbers of surviving plants as of 2006 include: 55 immature individuals at the Koaia Tree Sanctuary, 201 immature individuals at Oweowe, 212 immature individuals at Puu Waawaa cone, 102 mature individuals at Kipuka Alala, 318 immature individuals at Puu Huluhulu, 32 immature individuals at Kipuku Kalawamauna #4, and 10 immature individuals at Kipuku Kalawamauna #6 (Big Island Plant Extinction Prevention Program 2006, U.S. Army Pohakuloa Training Area 2006). In total, 163 mature and 848 immature individuals are known from eight different populations.

In the absence of large-scale fence units, feral pigs (*Sus scrofa*), goats (*Capra hircus*), mouflon (*Ovis musimon*) have been observed degrading the habitat for this species (Factors A and D). Ungulates are present in the area and are impacting the common native species that make up the habitat. Habitat degradation by and competition with invasive introduced plant species (Factor E), including *Pennisetum setaceum* (fountain grass) and *Kalanchoe tubiflora* (chandelier plant), threatens *Solanum incompletum* (USFWS 1999). *Solanum incompletum* is also threatened by the lack of reproductive vigor (Factor E). This could possibly be due to the low amount of genetic variation in existing individuals, loss of pollinators or some other component of its reproductive cycle. Few plants have produced seed and most of the stored and outplanted material in the past was derived from one location (U.S. Army Pohakuloa Training Area 2006). Rats may eat the seeds of *Solanum incompletum* (Factor C). Mice go after fruit in the greenhouse (Factor C) (Big Island Plant Extinction Prevention Program 2006).

More than 20,000 seeds are in storage from all but one of the present *S. incompletum* locations. The majority of the seed is from greenhouse grown individuals representing three founders. All known plants are fenced within small-scale emergency fences, with invasive plant and rodent control around the immediate vicinity of each individual. A large-scale fence is under construction to protect the plants and their habitat (U.S. Army Pohakuloa Training Area 2006).

Stabilizing, downlisting, and delisting objectives are provided in addendum to the recovery plan for multi-island plants (USFWS 1999), based on whether the species is an annual, a short-lived perennial (fewer than 10 years), or a long-lived perennial. *Solanum incompletum* is a short-lived perennial, and to be considered stable, the taxon must be managed to control threats (e.g., fenced) and be represented in an *ex situ* (at other than the plant's natural location, such as a nursery or arboretum) collection. In addition, a minimum of three populations should be documented on islands where they now occur or occurred historically. Each of these populations must be naturally reproducing and increasing in number, with a minimum of 50 mature individuals per population.

The stabilization goals for this species have not been met (see Table 1), as only two populations have over 50 individuals mature individuals. Therefore, *Solanum incompletum* meets the definition of endangered as it remains in danger of extinction throughout its range.

Recommendations for Future Actions:

- Collect fruit from all remaining naturally occurring individuals for genetic storage.
- Augment reintroductions with representatives of all naturally occurring individuals.
- Monitor of all known locations in order to determine recruitment activity.
- Construct large-scale fencing around all wild and reintroduced individuals.
- Control invasive introduced plant species and rodents around all wild and reintroduced individuals.
- Continue reintroducing individuals into protected suitable habitat and expand to additional locations.
- Study reintroduced *Solanum incompletum* populations with regard to population size and structure, geographical distribution, flowering cycles, pollination vectors, seed dispersal agents, longevity, specific environmental requirements, limiting factors, and threats.

References:

- Big Island Plant Extinction Prevention Program. 2006. Program Database. Unpublished.
- U.S. Army Pohakuloa Training Area. 2006. Update for genetic safety net species found at Pohakuloa Training Area. U.S. Army Garrison Hawaii. Unpublished.
- [USFWS] U.S. Fish and Wildlife Service. 2007. Rare plant tracking database. August 29, 2007. Unpublished.
- [USFWS] U.S. Fish and Wildlife Service. 2003. Endangered and threatened wildlife and plants; final designation and nondesignation of critical habitat for 46 plant species from the island of Hawaii, HI; final rule. Federal Register 68(127):39624-39722.
- [USFWS] U.S. Fish and Wildlife Service. 1999. Recovery plan for multi-island plants. U.S. Fish and Wildlife Service, Portland, OR. 206 pages + appendices.

[USFWS] U.S. Fish and Wildlife Service. 1994. Endangered and threatened wildlife and plants; determination of endangered status for thirteen plants from the island of Hawaii, state of Hawaii. Federal Register 61(198):53137-53153.

Table 1. Status of *Solanum incompletum* from listing through 5-year review.

Date	No. wild indivs	No. outplanted	Stability Criteria identified in Recovery Plan	Stability Criteria Completed?
1994 – listing	2	0	All threats managed in all 3 populations	No
			Complete genetic storage	No
			3 populations with 50 mature individuals each	No
1998 – recovery plan	40	0	All threats managed in all 3 populations	Partial
			Complete genetic storage	Partial
			3 populations with 50 mature individuals each	Partial, 1 population
2003 – critical habitat	12	527	All threats managed in all 3 populations	Partial
			Complete genetic storage	Partial
			3 populations with 50 mature individuals each	No
2007 – 5-yr review	83	950 (ca 10% mature)	All threats managed	Partial
			Complete genetic storage	Partial
			3 populations with 50 mature individuals each	Partial, only 2 populations

U.S. FISH AND WILDLIFE SERVICE
SIGNATURE PAGE for 5-YEAR REVIEW on *Solanum incompletum*

Pre-1996 DPS listing still considered a listable entity? N/A

Recommendation resulting from the 5-year review:

- Delisting
- Reclassify from Endangered to Threatened status
- Reclassify from Threatened to Endangered status
- No Change in listing status

Field Supervisor, Fish and Wildlife Service

Approve 

Date 1/18/08