5-YEAR REVIEW

Short Form Summary

Species Reviewed: *Trematolobelia singularis* (no common name)

Current Classification: Endangered

Federal Register Notice announcing initiation of this review:

[USFWS] U.S. Fish and Wildlife Service. 2010. Endangered and threatened wildlife and plants; initiation of 5-year status reviews of 58 species in Washington, Oregon, California, and Hawaii. Federal Register 75(226):71726-71729.

Lead Region/Field Office:

Region 1/Pacific Islands Fish and Wildlife Office (PIFWO), Honolulu, Hawaii

Name of Reviewer(s):

Jiny Kim, Fish and Wildlife Biologist, PIFWO

Daniel Clark, Oahu, Kauai, Northwest Hawaiian and American Samoa Islands Team Manager, PIFWO

Marie Bruegmann, Plant Recovery Coordinator, PIFWO

Recovery Program Lead, PIFWO

Kristi Young, Programmatic Deputy Field Supervisor, PIFWO

Methodology used to complete this 5-year review:

This review was conducted by staff of the Pacific Islands Fish and Wildlife Office of the U.S. Fish and Wildlife Service (USFWS), beginning on January 31, 2012. The review was based on a review of current, available information since the last five-year review for *Trematolobelia singularis* (USFWS 2009). The National Tropical Botanical Garden provided an initial draft of portions of the five-year review and recommendations for conservation actions needed prior to the next five-year review. The document was reviewed by the Fish and Wildlife Biologist, Islands Team Manager, and Plant Recovery Coordinator, followed by the Recovery Program Lead. It was subsequently reviewed and approved by the Programmatic Deputy Field Supervisor.

Background:

For information regarding the species listing history and other facts, please refer to the Fish and Wildlife Service's Environmental Conservation On-line System (ECOS) database for threatened and endangered species (http://ecos.fws.gov/tess_public).

Review Analysis:

Please refer to the previous 5-year review for *Trematolobelia singularis* published on June 2, 2009 (available at http://ecos.fws.gov/docs/five_year_review/doc2430.pdf) for a complete review of the species' status, threats, and management efforts. 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 *T. singularis*.

This short-lived shrub is endangered and occurs on Oahu. The current status and trends for *Trematolobelia singularis* are provided in the tables below.

New taxonomic information:
A revision of the genus *Trematolobelia* in 2009 confirmed that *T. singularis* remains defined as a separate species from *T. macrostachys*. Profound differences in floral morphology and presentation, as well as the lack of intermediates with *T. macrostachys*, suggests a level of reproductive isolation appropriate for distinction at the species rank, despite the fact that the two species occur in the same area (Lammers 2009).

New status information
Four populations of *Trematolobelia singularis* are known. At Waiawa-Waihole summit there were 16 mature and 75 immature individuals in 2010. At Konahuanui Crest and the summit over Manoa Valley two individuals were last observed in 2006. Seventeen immature individuals were seen at Moanalua in 2007, and two mature individuals were seen at Wailupe near the Hawaii Loa Summit. This species totals 20 mature and 92 immature individuals in all populations (Oahu Plant Extinction Prevention Program [OANRP] 2012), which represents a slight decline from the 133 reported in the last five-year review.

New threats:

- Climate change - Climate change may also pose a threat to this species. However, current climate change analyses in the Pacific Islands lack sufficient spatial resolution to make predictions on impacts to this species. The Pacific Islands Climate Change Cooperative (PICCC) funded climate modeling that will help resolve these spatial limitations. High spatial resolution climate outputs are expected in 2013.

New management actions:

  - Threats research - Invasive slugs may negatively impact the regeneration of *Trematolobelia singularis*, and control may now be possible. In 2009, slug control research using Sluggo, a slug and snail bait, began in the field at the Kahanahaiki population on U.S. Army lands (U.S. Army Garrison 2009, 2010). In 2010 Sluggo was registered for use in the State of Hawaii by the Hawaii Department of Agriculture (Joe 2011) for control of slugs and nonnative snails in forested areas for the protection of native, threatened, and endangered plants of Hawaii. However, since native snails also exist in areas where threatened and endangered plants occur, additional research is need to find a control method that can be used in areas where native snail species co-occur with listed plants to prevent non-target species impacts during treatment.
- Captive propagation for genetic storage and reintroduction
  - The Harold L. Lyon Arboretum (2012) has 21 collections of *Trematolobelia singularis* in seed storage for the OANRP, with a total of 19,411seeds from four different populations, and 161 plants from two founder populations in micropropagation.

- One seed accession at the National Tropical Botanical Garden (NTBG) has been in storage since it was collected in 1991 in Kohahuanui. Viability is doubtful (M. Clark, NTBG, pers. comm. 2013).

Synthesis:
Stabilizing, downlisting, and delisting objectives are provided in the recovery plan for plants from the island of Oahu (USFWS 1998), based on whether the species is an annual, a short-lived perennial (fewer than 10 years), or a long-lived perennial. *Trematolobelia singularis* 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 the island of Oahu. 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, as there are no populations of 50 or more mature individuals (Table 1) and all threats are not being sufficiently managed throughout the populations (Table 2). Therefore, *Trematolobelia singularis* meets the definition of endangered as it remains in danger of extinction throughout its range.

Recommendations for Future Actions:

- Captive propagation for genetic storage and reintroduction
  - Continue to collect cuttings or seed from tagged individuals, keeping close track of the maternal source for use in *ex situ* propagation.
  - Germination trials should be conducted on seeds stored at the NTBG to determine viability.
- Reintroduction / translocation
  - While surveying for new populations or reintroduced populations, determine which sites are least invaded by invasive introduced plant species and which appear to have the highest likelihood of maintaining new reintroductions.
  - Reintroduce the species back into its known historical range.
- Ungulate exclosures – Construct, maintain, and monitor ungulate-proof exclosures around each population.
- Ecosystem-altering invasive plant species control – Control invasive introduced plant species around all populations.
- Predator / herbivore control – Implement effective control methods for rodents and slugs.
- Fire protection – Develop and implement fire management plans for all wild and reintroduced populations.
- Alliance and partnership development - Enhance coordination and collaboration among other land managers to initiate planning and contribute to implementation of ecosystem-level restoration and management to benefit this species.
- Genetic research – Assess genetic variability within extant populations.

- Population biology research – Study *Trematolobelia singularis* 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.
- Threats research – Assess the modeled effects of climate change on this species, and use the results to determine future landscape needed for the recovery of the species.

Table 1. Status and trends of *Trematolobelia singularis* from listing through current 5-year review.

Date	No. wild individuals	No. outplanted	Stabilization Criteria identified in Recovery Plan	Stabilization Criteria Completed?
1996 (listing)	~65	0	All threats managed in all 3 populations	No
			Complete genetic storage	No
			3 populations with 50 mature individuals each	Unknown
1998 (recovery plan)	~165	0	All threats managed in all 3 populations	No
			Complete genetic storage	No
			3 populations with 50 mature individuals each	Partially
2003 (critical habitat)	~165	0	All threats managed in all 3 populations	No
			Complete genetic storage	No
			3 populations with 50 mature individuals each	Partially
2009 (5-yr review)	133	0	All threats managed in all 3 populations	No
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	Partially
2013 (5-yr review)	20 mature, 92 immature – total 112	0	All threats managed in all 3 populations	No (see Table 2)
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	No

Table 2. Threats to *Trematolobelia singularis* and ongoing conservation efforts.

Threat	Listing factor	Current Status	Conservation/ Management Efforts
Ungulates – Degradation of habitat by feral pigs	A, D	Ongoing	No - Threat at Waiawa-Waihole Summit – no fence yet
Established ecosystem-altering invasive plant species	A, E	Ongoing	No - Threat at Konahuanui crest and Wailupe
Rat predation of seeds	C	Ongoing	Threat at Wailupe – No
Slug herbivory	C	Ongoing	None
Human traffic from hiking at utility pole maintenance	E	Ongoing	None
Low numbers exacerbate risks from random natural events	E	Ongoing	Partially: Captive propagation and genetic storage
Climate change	E	Increasing	None

References:

See previous 5-year review for a full list of references (USFWS 2009). Only references for new information are provided below.

Harold L. Lyon Arboretum. 2012. Micropropagation database and seed storage inventory. University of Hawaii at Manoa, Honolulu, Hawaii. Unpublished.

Joe, S. 2011. Special local needs registration for Sluggo approved in the state of Hawaii through 2015. Ecosystem Management Program Bulletin 52:1-8. Available online at http://manoa.hawaii.edu/hpicesu/DPW/EMP_Spring_2011.pdf.

Lammers, T. G. 2009. Revision of the endemic Hawaiian genus *Trematolobelia* (Campanulaceae: Lobelioideae). Brittonia 61(2):126-143.

[OANRP] Oahu Plant Extinction Prevention Program. 2012- Population reference site summary report; *Trematolobelia singularis.* 1 page. Unpublished.

U.S. Army Garrison. 2009. 2009 status report for the Makua and Oahu implementation plans. U.S. Army Garrison, Hawaii and Pacific Cooperative Park Studies Unit. Schofield Barracks, Hawaii. 711 pages. Available online at <http://manoa.hawaii.edu/hpicesu/DPW/2009_OIP/2009_OIP_Edited.pdf>.

U.S. Army Garrison. 2010. 2010 status report for the Makua and Oahu implementation plans. U.S. Army Garrison, Hawaii and Pacific Cooperative Park Studies Unit. Schofield Barracks, Hawaii. 588 pages. Available online at <http://manoa.hawaii.edu/hpicesu/DPW/2010_YER/2010_YER_Edited.pdf>.

[USFWS] U.S. Fish and Wildlife Service. 1998. Recovery plan for the Oahu plants. Portland, Oregon. 207 pages + appendices.

[USFWS] U.S. Fish and Wildlife Service. 2009. *Trematolobelia singularis* (no common name) 5-year review summary and evaluation. U.S. Fish and Wildlife Service, Honolulu, Hawaii. 6 pages. Available online at <http://ecos.fws.gov/docs/five_year_review/doc2430.pdf>.

Personal Communications:

Clark, Margaret. 2012. Seed Bank Manager, National Tropical Botanical Garden. Memo to the Record, dated October 6, 2012. Subject: *Trematolobelia singularis* in NTBG seed storage.

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SIGNATURE PAGE for 5-YEAR REVIEW of *Trematolobelia singularis* (no common name)

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
_X_ No Change in listing status

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Date 2013-08-15