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. 2017. Endangered and threatened wildlife and plants; initiation of 5-year status reviews for 138 species in Hawaii, Oregon, Washington, and California. Federal Register 82(75): 18665–18668, April 20, 2017.

Lead Region/Field Office:

Region 1/Pacific Islands Fish and Wildlife Office (PIFWO), Honolulu, Hawai‘i

Name of Reviewer:

Cheryl Phillipson, Biologist, PIFWO
Lauren Weisenberger, Plant Recovery Coordinator, PIFWO
Megan Laut, Conservation & Restoration Team Manager, PIFWO

Methodology used to complete this 5-year review:

This review was conducted by staff of the Pacific Islands Fish and Wildlife Office (PIFWO) of the U.S. Fish and Wildlife Service (Service) beginning in October 2018. The review was based on a review of current, available information since the last 5-year review for *Trematolobelia singularis* (USFWS 2013). The evaluation completed by Cheryl Phillipson, Biologist, was reviewed by Lauren Weisenberger, Plant Recovery Coordinator, and Megan Laut, Conservation and Restoration Team Manager.

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 reviews for *Trematolobelia singularis* published in the Federal Register on June 2, 2009 and August 15, 2013 (available at *https://ecos.fws.gov/docs/five_year_review/doc2430.pdf* and *https://ecos.fws.gov/docs/five_year_review/doc4244.pdf*) for a complete review of the species' status, threats, and management efforts. We are not aware of any significant new information regarding the species' biological status since listing to warrant a change in the Federal listing status of *T. singularis*.

This short-lived perennial shrub in the Campanulaceae (bellflower) family is endangered and endemic to O‘ahu. The current status and trends for *Trematolobelia singularis* are provided in the tables below.

New Status Information:

- Currently, there are four populations of *Trematolobelia singularis* at the Waiāhole to Waiawa summit, Moanalua, Kōnāhuanui, and Wailupe to Hawaiiloa summit, totaling 133 mature and immature individuals (Keir 2016).
- In 2012, 14 critical habitat units were designated in two ecosystems (lowland wet and wet cliff) for *Trematolobelia singularis* in the Koʻolau mountains of Oʻahu (30,058 acres, 12,162 hectares) (77 FR 57648, September 18, 2012).

New Threats:

- Climate change loss or degradation of habitat—Climate change may pose a threat to this species. Fortini *et al.* (2013) conducted a landscape-based assessment of climate change vulnerability for native plants of Hawaiʻi using high resolution climate change projections. Climate change vulnerability is defined as the relative inability of a species to display the possible responses necessary for persistence under climate change. The assessment by Fortini *et al.* (2013) concluded that *Trematolobelia singularis* is extremely vulnerable to the impacts of climate change, with a vulnerability score of 0.951 (on a scale of 0 being not vulnerable to 1 being extremely vulnerable to climate change). In addition, the assessment classified *T. singularis* as a "wink-out" species. "Wink-out" species are those with no future climate envelope. No projected suitable climate areas exist for the species to persist into the future. Therefore, additional management actions may be needed to conserve this taxon into the future, such as ensuring that adequate viable genetic storage is maintained, identifying suitable microsites where climate change effects are anticipated to occur more slowly, and considering suitable habitat in areas outside of its known range.
- Landslides destruction and degradation of habitat—Landslides are observed to be a threat to *Trematolobelia singularis* as it occurs in exposed summit areas and along cliffs (Keir 2016).

New Management Actions:

- Ungulate control—Construction of fencing is proposed at three of the four areas where *Trematolobelia singularis* occurs (ANRP 2018).
- Captive propagation for genetic storage and reintroduction—
    - Since the last 5-year review, Lyon Arboretum Seed Conservation Laboratory reports storage of more than 20,000 seeds collected from at least 10 individuals from Waiawa, Wailupe, Moanalua, and Kōnāhuanui populations (Lyon Arboretum 2018.). In addition, the Lyon Arboretum Micropropagation Laboratory reports 119 explants representing three individuals from two populations of *Trematolobelia singularis* (Lyon Arboretum 2018.).

Synthesis:

Currently there are 133 mature and immature individuals of *Trematolobelia singularis* in the southern Koʻolau mountains of Oʻahu. A landscape-based assessment of climate change vulnerability for native plants of Hawaiʻi using high resolution climate change projections was made by Fortini *et al.* (2013) and their analysis showed that *T. singularis* is extremely vulnerable to the effects of climate change and is a "wink-out" species.

Collection and propagation are ongoing. Construction of fencing is planned to protect three subpopulations of *T. singularis*.

Stabilizing (interim), downlisting, and delisting objectives were provided in the Recovery Plan for the O‘ahu Plants (USFWS 1998), and have been updated according to the draft revised recovery objective guidelines developed by the Hawai‘i and Pacific Plants Recovery Coordinating Committee (HPPRCC 2011). The HPPRCC identifies an additional initial objective, the Preventing Extinction Stage, in addition to the Interim Stabilization, Delisting, and Downlisting objectives. Furthermore, life history traits such as breeding system, population size fluctuation or decline, and reproduction type (sexual or vegetative), have been included in the calculation of goals for the number of populations and reproducing individuals for each stage. The goals for each stage remain grouped by life span defined as annual, short-lived perennial (fewer than 10 years), or long-lived perennial.

Trematolobelia singularis is a short-lived perennial shrub. To prevent extinction, which is the first step in recovering the species, the taxon must be managed to control threats (*e.g*., fenced) and have 50 individuals (or the total number of individuals if fewer than 50 exist) from each of three populations represented in *ex situ* (secured off-site, such as a nursery or seed bank) collections. In addition, a minimum of three populations should be documented on O‘ahu where they now occur or occurred historically and each of these populations must be naturally reproducing (*i.e.,* viable seeds, seedlings, saplings) and increasing in number, with a minimum of 50 mature, reproducing individuals per population.

The preventing extinction goals for this species have not been met. No population totals more than 50 mature individuals and plants continue to decline in numbers. Genetic representation is incomplete and not all threats are managed (Table 1, Table 2). Therefore, *Trematolobelia singularis* meets the definition of Endangered as it remains in danger of extinction throughout its range.

Recommendations for Future Actions:
We are not aware of any new threats except for landslides and the new data on this taxon’s vulnerability to climate change. There is no significant new information regarding the species’ biological status since the last 5-year review in 2013. Thus, the following recommendations for future actions are added or reiterated for the 5-year review for 2019.

- Ungulate monitoring and control—Construct and maintain fencing and monitor populations to protect plants from impacts of feral ungulates.
- Invasive plant monitoring and control—Control established ecosystem-altering nonnative invasive plant species, and those that compete with *Trematolobelia singularis* at all populations.
- Fire management—Develop and implement fire management plans for all populations and coordinate fire response efforts.

- Build resilience and redundancy–Increase numbers of populations and individuals scattered through suitable habitat to reduce impacts from landslides.
- Climate change adaptation strategy—Assess the effects of climate change on this species and use to determine future landscape needed for the recovery of the species.
- Predator and herbivore control—Implement effective control methods for rodents and slugs.
- Captive propagation for genetic storage and reintroduction—
  - Continue seed collections from tagged individuals, keeping close track of the maternal source for use in *ex situ* propagation.
  - Conduct germination trials on seeds stored at the NTBG to determine viability.
- Reintroduction—Establish new populations and determine which reintroduction sites have the highest likelihood of success.
- 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.
- Alliance and partnership development—Enhance coordination and collaboration land managers to initiate planning and contribute to implementation of ecosystem-level restoration and management to benefit this 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)	165	0	All threats managed in all three populations	No
			Complete genetic storage	No
			Three populations with 50 mature individuals each	Unknown
1998 (recovery plan)	165	0	All threats managed in all three populations	No
			Complete genetic storage	No
			Three populations with 50 mature individuals each	Partially
2003 (critical habitat)	165	0	All threats managed in all three populations	No

			Complete genetic storage	No
			Three populations with 50 mature individuals each	Partially
2009 (5-year review)	133	0	All threats managed in all three populations	No
			Complete genetic storage	Partially
			Three populations with 50 mature individuals each	Partially
2012 (critical habitat)	360	0	All threats managed in all three populations	No
			Complete genetic storage	Partially
			Three populations with 50 mature individuals each	Partially
2013 (5-year review)	20 mature, 92 immature, total 112	0	All threats managed in all three populations	No
			Complete genetic storage	Partially
			Three populations with 50 mature individuals each	No
Date	**No. wild individuals**	**No. outplanted**	***Preventing Extinction Criteria identified by HPPRCC**	***Preventing Extinction Criteria Completed?**
2019 (5-year review)	133	0	All threats managed in all three populations	No
			Complete genetic storage	Partially

			Reproduction (*i.e.* viable seeds, seedlings) at all three populations	No
			Three populations with 50 mature individuals each	Partially, only one population > 50 individuals

* The Preventing Extinction Stage was established in 2011. Prior to 2011, the Interim Stabilization Stage was the first stage towards recovery (now it is the second after Preventing Extinction).

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

Threat	Listing factor	Current Status	Conservation/ Management Efforts
Ungulate destruction and degradation of habitat	A	Ongoing	Partial, fencing proposed
Degradation of habitat by established ecosystem-altering invasive plant species	A	Ongoing	None
Fire destruction and degradation of habitat	A	Ongoing	None
Landslides destruction and degradation of habitat	A	Ongoing	None
Climate change degradation or loss of habitat	A	Ongoing	None
Ungulate predation and herbivory	C	Ongoing	Partial, fencing proposed
Invertebrate predation and herbivory	C	Ongoing	None
Competition with established invasive plant species	E	Ongoing	None
Human disturbance—Hikers and military activity	E	Ongoing	None
Low numbers	E	Ongoing	Partial, collection and propagation ongoing

References:
See previous 5-year reviews for a full list of references (USFWS 2009, 2013). Only references for new information are provided below.

[ANRP] Army Natural Resource Program-O‘ahu. 2018. 2018 status report for the Makua and Oahu implementation plans. 217 pp.

Fortini, L., J. Price, J. Jacobi, A. Vorsino, J. Burgett, K. Brinck, F. Amidon, S. Miller, S. Gon II, G. Koob, and E. Paxton. 2013. A landscape-based assessment of climate change vulnerability for all native Hawaiian plants. Technical report HCSU-044. Hawaii Cooperative Studies Unit, University of Hawaii at Hilo, Hawaii. 134 pp.

[HPPRCC] Hawai‘i and Pacific Plants Recovery Coordinating Committee. 2011. Revised recovery objective guidelines. 8 pp.

Keir, M. 2016. *Trematolobelia singularis.* The IUCN Red List of Threatened Species 2016: e.T80221174A80221198. *http://dx.doi.org/10.2305/IUCN.UK.2016-2.RLTS.T80221174A80221198.en*.

Lyon Arboretum. 2018. Report on controlled propagation of listed species, as designated under the U.S. Endangered Species Act. Unpublished report submitted to the U.S. Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office, Honolulu, Hawaii.

[USFWS] U.S. Fish and Wildlife Service. 2012. Endangered and threatened wildlife and plants; Endangered status for 23 species on Oahu and designation of critical habitat for 124 species; final rule. Department of the Interior, Federal Register 77 (181): 57648–57862, September 18, 2012.

[USFWS] 2013. *Trematolobelia singularis* 5-year review summary and evaluation. USFWS Pacific Islands Fish and Wildlife Office, Honolulu, HI. *https://ecos.fws.gov/docs/five_year_review/doc4244.pdf.*

[USFWS] 2017. Endangered and threatened wildlife and plants; initiation of 5-year status reviews for 138 species in Hawaii, Oregon, Washington, and California. Federal Register 82(75): 18665–18668, April 20, 2017.

U.S. FISH AND WILDLIFE SERVICE
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

For **Field Supervisor, Pacific Islands Fish and Wildlife Office**

MEGAN LAUT Digitally signed by MEGAN LAUT
Date: 2019.09.27 10:29:29 -10'00'

_____ Date_____