5-YEAR REVIEW

Short Form Summary

Species Reviewed: *Spermolepis hawaiiensis* (no common name)

Current Classification: Endangered

Federal Register Notice announcing initiation of this review:

[USFWS] U.S. Fish and Wildlife Service. 2019. Endangered and threatened wildlife and plants; initiation of 5-year status reviews for 91 species in Oregon, Washington, Hawaii, and American Samoa. Federal Register 84(112): 27152–27154, June 11, 2019.

Lead Region/Field Office:

Interior Region 12/Pacific Islands Fish and Wildlife Office (PIFWO), Honolulu, Hawai‘i

Name of Reviewer:

Daniel Adamski, 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 2020. The review was based on a review of current, available information since the last 5-year review for *Spermolepis hawaiiensis* (USFWS 2015). The evaluation by Daniel Adamski, 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 *Spermolepis hawaiiensis* published in the Federal Register on August 27, 2010 and August 20, 2015 and (available at *https://ecos.fws.gov/docs/tess/species_nonpublish/1658.pdf* and *https://ecos.fws.gov/docs/tess/species_nonpublish/2301.pdf*) for a complete review of the species' status, threats, management efforts, and references cited. 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 *S. hawaiiensis*.

This short lived annual herb in the Apiaceae (parsley) family is endangered and endemic to the islands of Kaua‘i, O‘ahu, Moloka‘i, Lāna‘i, Maui, and Hawai‘i. The status and trends for *Spermolepis hawaiiensis* are provided in the tables below.

New Status Information:

- *Spermolepis hawaiiensis* is an ephemeral species, and although it is an annual, it may not always be present throughout its entire range unless environmental conditions are favorable (U.S. Army 2020). Currently, monitoring at Pohakuloa Training Area (PTA) on the island of Hawai‘i documented 595 individual plants in 3 separate plant groups around Pu‘u Pāpapa in the Ke‘āmuku Maneuver Area (U.S. Army 2020). Previous monitoring documented 4 separate plant groups and 1,356 individual plants (U.S. Army 2015).
- Currently, in addition to the 595 plants on Hawai‘i, there are 4 populations on O‘ahu totaling approximately 300-500 individuals; 4 populations on Maui totaling approximately 3,000-5,000 individuals; 3 populations on Moloka‘i totaling approximately 1,000 individuals; four populations on Lāna‘i totaling approximately 1,000 individuals; and presumed present but unknown number of populations and individuals on Kaua‘i (PEPP 2021).
- In 2003, 2 critical habitat units in 1 ecosystem (lowland dry) were designated for *Spermolepis hawaiiensis* on Kaua‘i (452 acres (ac), 183 hectares (ha) (68 FR 9229, February 27, 2003). In 2012, 16 critical habitat units in 2 ecosystems (lowland dry and dry cliff) were designated for *S. hawaiiensis* in the Wai‘anae Mountains on O‘ahu (2225 ac, 900 ha) (77 FR 57708, September 18, 2012). In 2016, 6 critical habitat units in 1 ecosystem (lowland dry) was designated for *S. hawaiiensis* on Maui (20,740 ac, 8393 ha), and 2 critical habitat units in 2 ecosystems (lowland mesic and montane mesic) were designated on Moloka‘i (9,586 ac, 3,879 ha) (81 FR 17790, March 30, 2016).

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 Hawai‘i 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, p. 89) concluded that *Spermolepis hawaiiensis* is vulnerable to the impacts of climate change, with a vulnerability score of 0.346 (on a scale of 0 being not vulnerable to 1 being extremely vulnerable to climate change). Therefore, additional management actions may be needed to conserve this taxon into the future, such as locating key microsites that overlap with current and future climate envelopes for outplanting efforts.

New Management Actions:

- Surveys and inventories— The Plant Extinction Prevention Program (PEPP) surveys *Spermolepis hawaiiensis* on O‘ahu and Maui. On a recent survey in the Wai‘anae Kai area of the Wai‘anae mountains, O‘ahu, approximately 330 plants were observed, and collections were made from 38 individual plants. On Maui, approximately 50 plants were observed in the Panaewa area (PEPP 2020).

- Ungulate monitoring and control— All known individuals of *S. hawaiiensis* at Pohakuloa Training Area (PTA) are protected within the Kipuka Alala north and south fence units and the Puʻu Pāpapa fence unit (U.S. Army 2020).
- Invasive plant monitoring and control— Invasive plants are controlled throughout the landscape of PTA (105.7 ha controlled), however, due to management challenges and the annual nature of *Spermolepis hawaiiensis*, invasive plants are not actively controlled near *S. hawaiiensis* individuals (PTA 2020)
- Captive propagation for genetic storage and reintroduction—
    - Hawai'i Volcanoes National Park controlled propagation facility (HAVO) reports 97,149 seeds in storage representing 3 founders (HAVO 2020).
    - Lyon Arboretum Micropropagation Laboratory reports 36 explants in propagation and the Lyon Seed Conservation Laboratory reports 3,935 seeds in storage from 11 founder plants (10 founders for seed storage and 1 founder for research) (Lyon Arboretum 2020).
    - Volcano Rare Plant Facility (VRPF) reports approximately 5000 seeds in storage (VRPF 2020).
    - National Tropical Botanic Garden (NTBG) reports 1,153 seeds in storage from 5 founder plants (NTBG 2020)
    - Pōhakuloa Controlled Propagation Facility (PCPF) reports 574,162 seeds in storage from 60 founders (PCPF 2020).
- Reintroduction—No new reintroductions have been reported for *Spermolepis hawaiiensis*, however, seed scattering was completed at 6 sites at PTA (U.S. Army 2020) and two sites at HAVO in 2014 (HAVO 2020).

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

Date	No. wild individuals	No. outplanted	Stability Criteria identified in Recovery Plan	Stability Criteria Completed?
1994 (listing)	1,000-1,000+	0	All threats managed in all 3 populations	No
			Complete genetic storage	No
			5-7 populations with 500 mature individuals each	No
1999 (recovery plan)	2,000-6,000	0	All threats managed in all 3 populations	Partially
			Complete genetic storage	Partially
			5-7 populations with 300 mature individuals each	No

2003 (critical habitat)	5,800-12,000	0	All threats managed in all 3 populations	Partially
			Complete genetic storage	Partially
			5-7 populations with 300 mature individuals each	No
2010 (5-year review)	10,200-13,100	>24,000 seeds scattered	All threats managed in all 3 populations	Partially
			Complete genetic storage	Partially
			5-7 populations with 300 mature individuals each	No
2012 (critical habitat)	>200-1000+ (Oahu)	n/a	All threats managed in all 3 populations	Partially
			Complete genetic storage	Partially
			5-7 populations with 300 mature individuals each	No
2012 (proposed critical habitat)	>3,600 (Molokai, Maui, Lanai)	n/a	All threats managed in all 3 populations	Partially
			Complete genetic storage	Partially
			5-7 populations with 300 mature individuals each	No
2015 (5-year review)	5,156-6,156	120 (535 natural recruits)	All threats managed in all 3 populations	Partially
			Complete genetic storage	Partially
			5-7 populations with 300 mature individuals each	No
Date	**No. wild individuals**	**No. outplanted**	***Preventing Extinction Criteria identified by HPPRCC**	***Preventing Extinction Criteria Completed?**
2021 (5-year review)	5,895-8,095	0 planted, 258 natural recruits	All threats managed in all 3 populations	Partially

			Complete genetic storage	Partially
			Natural reproduction at all 3 populations	Partially
			3 populations with 50 mature individuals each	No

* 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 stage after Preventing Extinction).

Table 2. Threats to *Spermolepis hawaiiensis* and ongoing conservation efforts.

Threat	Listing factor	Current Status	Conservation/ Management Efforts
Ungulate degradation of habitat	A	Ongoing	Partial, PTA is fenced
Established ecosystem altering invasive plant species degradation of habitat	A	Ongoing	Partial, nonnative plant control ongoing at PTA
Drought destruction and degradation of habitat	A	Ongoing	None
Fire destruction or degradation of habitat	A	Ongoing	Partial, tied to invasive plant control efforts at PTA
Ungulate predation or herbivory	C	Ongoing	Partial, PTA is fenced
Military activities	E	Ongoing	Partially, ESA consultations at PTA
Climate change degradation or loss of habitat, including hurricanes	E	Ongoing	None

Synthesis:
Currently there are approximately 5,895-8,095 wild individuals of *Spermolepis hawaiiensis* on Kauaʻi, Oʻahu, Molokaʻi, Lānaʻi, Maui, and Hawaiʻi. 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 *S. hawaiiensis* is vulnerable to the effects of climate change. Individuals are provided protection by fencing and nonnative plant control. Seed collections, propagation, and outplanting are ongoing.

Stabilizing (interim), downlisting, and delisting objectives were provided in the Recovery Plan for multi-island plants (USFWS 1999) and have been updated according to the draft revised recovery objective guidelines developed by the Hawaiʻi 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.

Spermolepis hawaiiensis is a short-lived annual herb. To prevent extinction, which is the first milestone 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 that are well managed. In addition, a minimum of three populations total should be documented on Kauaʻi, Oʻahu, Molokaʻi, Lānaʻi, Maui, and/or Hawaiʻi where they now occur or occurred historically and each of these populations must be naturally reproducing (i.e., viable seeds, seedlings), with a minimum of 50 mature, reproducing individuals per population.

The preventing extinction goals for this species have not been met. Although genetic storage is almost complete (Table 1), there are not three naturally reproducing populations totaling at least 50 reproducing individuals, and all threats are not being managed (Table 1, Table 2). Therefore, *Spermolepis hawaiiensis* 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 or significant new information regarding the species' biological status since the last 5-year review in 2015. Thus, the following recommendations for future actions are reiterated for the 5-year review for 2020.

- Surveys and inventories—
    - The historical range of *Spermolepis hawaiiensis* should be surveyed intensively.
    - Determine if historical populations are extirpated.
    - Determine sites that have the highest likelihood of maintaining reintroductions.
- Ungulate monitoring and control—Continue to maintain fenced exclosures to protect individuals from the negative impacts of browsing by ungulates.
- Invasive plant monitoring and control—Continue control of established ecosystem-altering nonnative invasive plant species, and those that compete with *S. hawaiiensis*.
- Site and habitat protection—Develop and implement effective control measures to reduce the impact of drought.
- Fire monitoring and control—Continue to develop and implement fire prevention management plans.

- Captive propagation for genetic storage and reintroduction—Continue collection and propagation efforts for maintenance of genetic stock and for reintroduction.
- Reintroduction and translocation—Continue to reintroduce individuals into suitable habitat within historic range that is being managed for known threats to this species to build resiliency and redundancy to reduce the impacts of invasive species, drought, fire, climate change, and potential impacts from military activities.
- Population biology research—
    - Determine which species may act as pollinators and which may assist with fruit dispersal.
    - Conduct genetic studies to determine genetic variation within the population (and between populations) and plan an effective breeding program.
- Alliance and partnership development—Continue to work with partners and other land managers in planning and implementation of ecosystem-level restoration and management to benefit this species.
- Climate change adaptation strategy—Assess the modeled effects of climate change on this species and use to determine future landscape needed for the recovery of the species.

References:

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.

[HAVO] Hawaii Volcanos Controlled Propagation Facility. 2020. 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, Hawai‘i.

[HBMP] Hawaii Biodiversity and Mapping Program. 2010. Plant species GIS data and Access species database.

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

Lyon Arboretum. 2020. 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.

[NTBG] National Tropical Botanic Garden. 2020. 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, Hawai‘i.

[PEPP] Plant Extinction Prevention Program. 2020. Annual report for plant extinction prevention program fiscal year 2020 (July 1, 2019-June 30, 2020). Unpublished report submitted to the U.S. Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office, Honolulu, Hawai‘i.

[PEPP] Plant Extinction Prevention Program, 2021. Notes and evaluation of multi-island species on PEPP list. Unpublished report submitted to U.S. Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office, Honolulu, Hawai‘i.

[PCPF] Pohakuloa Control Propagation Facility. 2020. Report on controlled propagation of listed and candidate 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, Hawai‘i.

[USFWS] 1999. Recovery Plan for Multi-Island Plants. USFWS Pacific Islands Fish and Wildlife Office, Honolulu, HI. https://ecos.fws.gov/docs/recovery_plan/990710.pdf.

[USFWS] 2003. Endangered and threatened wildlife and plants, final designation or nondesignation of critical habitat for 95 plant species from the islands of Kaua‘i and Niihau, HI; final rule. 68 FR 9116, February 27, 2003. cluster. U.S. Fish and Wildlife Service, Portland, Oregon. 252 pages.

[USFWS] 2010. *Genus species* 5-year review summary and evaluation. USFWS Pacific Islands Fish and Wildlife Office, Honolulu, HI. *https://ecos.fws.gov/docs/tess/species_nonpublish/1658.pdf.*

[USFWS] 2015. *Genus species* 5-year review summary and evaluation. USFWS Pacific Islands Fish and Wildlife Office, Honolulu, HI. *https://ecos.fws.gov/docs/tess/species_nonpublish/2301.pdf.*

[USFWS] 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] 2016. Endangered and threatened wildlife and plants; designation and nondesignation of critical habitat on Moloka‘i, Lanai, Maui, and Kahoolawe for 135 species; final rule. 81 FR 17790, March 30, 2016.

[USFWS] 2019. Endangered and threatened wildlife and plants; initiation of 5-year status reviews for 91 species in Oregon, Washington, Hawaii, and American Samoa. Federal Register 84(112): 27152–27154, June 11, 2019.

[U.S. Army] U.S Army Garrison Pohakuloa. 2015. FY 2014 annual report for the natural resources office, Pohakuloa Training Area, Island of Hawaii. 84 pages. Unpublished report submitted to the U.S. Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office, Honolulu, Hawaii.

[U.S. Army] U.S Army Garrison Pohakuloa. 2020. FY 2019 Biennial Report for the natural resources office, Pohakuloa Training Area, Island of Hawaii. 406 pages. Unpublished report submitted to the U.S. Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office, Honolulu, Hawaii.

[VRPF] Volcano Rare Plant Facility. 2020. Report on controlled propagation of listed and candidate 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, Hawai‘i.

U.S. FISH AND WILDLIFE SERVICE
SIGNATURE PAGE for 5-YEAR REVIEW of
Spermolepis hawaiiensis (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: 2021.09.16 11:07:59 -10'00'

_____ Date_____