5-YEAR REVIEW

Short Form Summary

Species Reviewed: *Geranium multiflorum* (nohoanu)

Current Classification: Endangered

Federal Register Notice announcing initiation of this review:

[USFWS] U.S. Fish and Wildlife Service. 2021. Endangered and Threatened Wildlife and Plants; Initiation of 5-Year Status reviews for 77 Species in Oregon, Washington, Idaho, and Hawaii. Federal Register 86(120):33726–33728, June 25, 2021.

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, Recovery 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 2022. The review was based on a review of current, available information since the last 5-year review for *Geranium multiflorum* (USFWS 2018). The evaluation by Cheryl Phillipson, Biologist, was reviewed by Lauren Weisenberger, Plant Recovery Coordinator, and Megan Laut, Recovery 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/ecp/species/3848*).

Review Analysis:

Please refer to the previous 5-year reviews for *Geranium multiflorum* published in the Federal Register on August 29, 2011, and October 23, 2018 (available at *https://ecos.fws.gov/docs/tess/species_nonpublish/1780.pdf* and *https://ecos.fws.gov/docs/tess/species_nonpublish/2632.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 *G. multiflorum*.

This short-lived perennial shrub in the Geraniaceae (geranium) family is endangered and is endemic to Haleakalā, east Maui. The status and trends for *Geranium multiflorum* are provided in the tables below.

New Status Information:

- In 2019, Haleakalā National Park (HALE NP) estimated there were 400 to 500 individuals of *Geranium multiflorum* in the park with plants outside the park bringing the total on Haleakalā to as many as 1,000 individuals (HALE NP 2019, p. 293). Currently, there are nine wild subpopulations at Honomanū, East Wailua Iki, Haleakalā-Kahikinui, Hanawī, Helele‘ike‘ōhā, Ko‘olau Gap, Kūhiwa, Kopili‘ula, and Waikamoi Gulch (Maui Plant Extinction Prevention Program [Maui PEPP] 2022; Grave and Kroessig 2020). In 2022, five new individuals were observed at Hanawī, and five individuals were translocated to East Wailua Iki (Maui PEPP 2022).
- Currently, there are three founders (wild plants) represented in *ex situ* storage and propagation.

New Threats:

- None reported.

New Management Actions:

- Monitoring and surveys—Maui PEPP surveys for individuals and monitors wild and translocated and augmented populations of *Geranium multiflorum* (Maui PEPP 2022). Haleakalā National Park (HALE NP) also monitors subpopulations within the park (HALE NP 2019; Gates 2021, pers. comm.).
- Collection and captive propagation for genetic storage and translocation—
    - In 2022, the Lyon Arboretum Seed Conservation Laboratory reported storage of 11 seeds representing two founders at Hanawī collected in 2021, and 55 seeds from one founder in Hanawī collected in 2011 (Lyon Arboretum 2022).
    - In 2022, Maui PEPP reported collection of cuttings representing one founder from a new subpopulation at Hanawī for propagation at the Olinda Rare Plant Facility (ORPF) on Maui (Maui PEPP 2022).
- Translocation and augmentation—
    - In 2022, Maui PEPP reported translocation of five individuals to East Wailua Iki (Maui PEPP 2022).
    - Since 2016, HALE NP translocated two individuals in the park (Gates 2021, pers. comm.; HALE NP 2019, p. 201). Natural recruitment has been observed in the park (HALE NP 2019, p. 301).

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

Date	No. wild individuals	No. outplanted	Stability Criteria identified in Recovery Plan	Stability Criteria Completed?
1992 (listing)	<3,000	0	All threats managed in all 3 populations	No
			Complete genetic storage	No
			3 populations with 25 mature individuals each	Yes
2011 (5-year review)	~600	89	All threats managed in all 3 populations	No
			Complete genetic storage	No
			3 populations with 25 mature individuals each	Yes
Date	**No. wild individuals**	**No. outplanted**	***Preventing Extinction Criteria identified by HPPRCC**	***Preventing Extinction Criteria Completed?**
2018 (5-year review)	500+	28	All threats managed in all 3 populations	Partially
			Reproduction (i.e., viable seeds, seedlings) at all 3 populations	No
			Complete genetic storage	Partially
			3 populations with 25 mature individuals each	No
2023 (5-year review)	500–1,000	5	All threats managed in all 3 populations	Partially
			Complete genetic storage	Partially
			Natural reproduction at all 3 populations	Partially, recruitment observed at HALE NP
			3 populations with 50[1] mature individuals each	Yes

* 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).

[1]We have increased the number of individuals in the criteria for preventing extinction because of the uncertainty regarding the longevity of this species.

Table 2. Threats to *Geranium multiflorum* and ongoing conservation efforts.

Threat	Listing factor	Current Status	Conservation/ Management Efforts
Degradation and destruction of habitat by feral ungulates	A	Ongoing	Partial, all subpopulations within exclosures
Established ecosystem altering invasive plant species degradation of habitat	A	Ongoing	Partial, some management in fenced areas
Climate change degradation or loss of habitat	A	Ongoing	None
Predation and herbivory by feral ungulates	C	Ongoing	Partial, all subpopulations within exclosures
Predation and herbivory by rodents	C	Ongoing	None
Predation and herbivory by invertebrates	C	Ongoing	None
Loss of mutualists—loss of pollinators and seed dispersers	E	Ongoing	None

Synthesis:
Currently, there are estimated to be between 500 and 1,000 wild individuals of *Geranium multiflorum* on Haleakalā (east Maui). All wild and translocated populations are within fenced areas. Nonnative invasive plants are controlled within HALE NP and Hanawī Natural Area Reserve. Limited seed and cuttings collection and translocation efforts are ongoing. Some natural recruitment is reported within HALE NP.

Stabilizing (interim), downlisting, and delisting objectives are provided in the Recovery Plan for the Maui Plant Cluster (Hawai‘i) (USFWS 1997) 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.

Geranium multiflorum is a short-lived perennial shrub. 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 a total of three populations should be documented on Maui 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 as, although there are three populations of at least 50 individuals, only one is reported to have natural recruitment, and genetic representation is incomplete (Table 1). In addition, all threats, including rodent and invertebrate predation and herbivory, and loss of mutualists, are not being sufficiently managed throughout the range of the species. Limited propagation and translocation are ongoing (Table 2). Therefore, *Geranium multiflorum* meets the definition of Endangered as it remains in danger of extinction throughout its range.

Recommendations for Future Actions:
No significant new information regarding the species' biological status has been reported since the last 5-year review in 2018. Thus, the following recommendations for future actions are added or reiterated for the 5-year review for 2023.

- Surveys and population monitoring—Survey known locations and areas of suitable habitat on Haleakalā to determine the current status of *Geranium multiflorum*.
- Ungulate monitoring and control—Continue to construct and maintain fencing to protect individuals from the negative impacts of feral ungulates.
- Invasive nonnative plant monitoring and control—Continue control of established ecosystem-altering nonnative invasive plant species at all populations of *G. multiflorum*.
- Climate change adaptation strategy—Assess the modeled effects of climate change on this species and use this information to determine future landscape needed for recovery.
- Predator and herbivore monitoring and control—
    - Implement effective control methods for rodents at all wild and translocated populations of *G. multiflorum*.
    - Develop and implement effective control methods for slugs and ants.
- Captive propagation for genetic storage and translocation—
    - Continue collection of genetic resources for storage, propagation, and translocation.
    - Evaluate genetic resources currently in storage to determine the need to place additional material into long-term storage due to this species' vulnerability to climate change.
- Translocation and augmentation—Continue to augment populations to expand and increase diversity of the species and translocate individuals into suitable habitat that is managed for known threats.

- Build resiliency, redundancy, and representation—Continue to augment populations and translocate individuals into suitable habitat that is being managed for known threats to this species to reduce impacts of predation and herbivory, and loss of mutualists.
- 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 taxon.

References:

Gates, N.B. 2021, Haleakalā National Park Superintendent, Haleakalā National Park comments on the initiation of 5-year status reviews for 77 species in Oregon, Washington, Idaho, and Hawai‘i. 19 AUG 2021, 8 pp.

Grave, E. and T. Kroessig. 2020. *Geranium multiflorum*. The IUCN Red List of Threatened Species 2020: e.T80090413A80090432. *https://dx.doi.org/10.2305/IUCN.UK.2020-1.RLTS.T80090413A80090432.en*.

[HALE NP] Haleakalā National Park. 2019. Natural resource condition assessment Haleakalā National Park, natural resource report NPS/HALE/NRR—2019/1977, National Park Service, U.S. Department of the Interior, Natural Resource Stewardship and Science. 386 pp.

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

Lyon Arboretum. 2022. 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.

[Maui PEPP] Maui Plant Extinction Prevention Program. 2022. Monthly Maui Nui plant species monitoring reports. Excel data table.

[USFWS] U.S. Fish and Wildlife Service 1997. Recovery Plan for the Maui Plant Cluster (Hawai‘i). Portland. 130 pp. + appendices.

[USFWS] 2011. *Geranium multiflorum* 5-year review summary and evaluation. USFWS Pacific Islands Fish and Wildlife Office, Honolulu, HI. *https://ecos.fws.gov/docs/tess/species_nonpublish/1780.pdf.*

[USFWS] 2018. *Geranium multiflorum* 5-year review summary and evaluation. USFWS Pacific Islands Fish and Wildlife Office, Honolulu, HI. *https://ecos.fws.gov/docs/tess/species_nonpublish/2632.pdf*.

[USFWS] 2021. Endangered and Threatened wildlife and plants; initiation of 5-year status reviews for 77 Species in Oregon, Washington, Idaho, and Hawaii. Federal Register 86(120): 33726–33728, June 25, 2021.

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SIGNATURE PAGE for 5-YEAR REVIEW of *Geranium multiflorum* (nohoanu)

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**

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