5-YEAR REVIEW

Short Form Summary

Species Reviewed: *Portulaca sclerocarpa* (po‘e)

Current Classification: Endangered

Federal Register Notice announcing initiation of this review:

[USFWS] U.S. Fish and Wildlife Service. 2018. Endangered and threatened wildlife and plants; initiation of 5-year status reviews for 156 species in Oregon, Washington, Hawaii, Palau, Guam, and the Northern Mariana Islands. Federal Register 88(83): 20088–20092, May 7, 2018.

Lead Region/Field Office:

Interior Region 12/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 2019. The review was based on a review of current, available information since the last 5-year review for *Portulaca sclerocarpa* (USFWS 2012). The evaluation 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 review for *Portulaca sclerocarpa* published in the Federal Register on August 28, 2012 (available at *https://ecos.fws.gov/docs/five_year_review/doc4062.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 *P. sclerocarpa*.

This short-lived perennial herb in the Portulacaceae (purslane) family is endangered and found on the island of Hawai‘i and is historic to an islet of Lāna‘i. The current status and trends for *Portulaca sclerocarpa* are provided in the tables below.

New Status Information:

- At the time of the 5-year review in 2012 there were 10 populations of *Portulaca sclerocarpa* totaling approximately 1,000 individuals. This species was not observed in a survey of Poʻopoʻo Islet off of Lānaʻi in 2006, and is now assumed to be extirpated. The number of mature individuals at Pōhakuloa Training Area (PTA) appears to be influenced by flushes of seedlings throughout the census periods, and numbers have been as low at 78 individuals (U.S. Army Garrison 2020, p. 22; PEPP 2019). In 2017, the Plant Extinction Prevention Program (PEPP) downgraded the status of the species from "PEP" (fewer than 50 wild plants) to "POP" (potential PEP), as, although PEPP reported that there are 167 plants known from four locations, some estimates of wild plants are as high as 3,000 individuals (PEPP 2017). At Hawaiʻi Volcanoes National Park (HVNP) there are three wild populations in the Kaʻu Desert area totaling 40 individuals and one wild population at Puhimau totaling 120 individuals; in 2019 at Pōhakuloa Training Area (PTA) there were 10 wild populations in four locations totaling 115 mature and 174 immature plants (Kīpuka ʻAlalā, Kīpuka Kalawamauna, Mixed Tree fence area, and Nāʻōhuleʻelua); and one wild population (one individual) at Puʻuanahulu ((National Park Service (NPS) 2015, p. 467; HVNP 2019a, 2019b p. 4; U.S. Army Garrison 2020, pp. 64–65). In summary, there are approximately 276 mature plants and possibly as many as 174 immature plants in 15 locations on the island of Hawaiʻi.
- Three critical habitat units in the coastal ecosystem (358 hectares, 884 acres) on Lānaʻi were proposed but excluded from designation because conservation actions of the landowner provide a greater benefit to the species than does designation of critical habitat (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 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 *Portulaca sclerocarpa* is vulnerable to the impacts of climate change, with a vulnerability score of 0.236 (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—
    - Field surveys to identify new populations in previously unsurveyed areas and in areas of suitable habitat are conducted at the Pōhakuloa Training Area (PTA) (U.S. Army Garrison 2020, p. 6).

    - HVNP monitors wild and reintroduced plants at seven sites (Kīpuka Māmane, Kaʻu Desert, Hilina Pali, Kīlauea Crater rim, Chain of Craters, Fire Safe Sites, and Puhimau) (NPS 2015, p. 467; HVNP 2019a, 2019b p. 4).
- Ungulate monitoring and control—
    - In 2014, the Plant Extinction Prevention Program (PEPP) constructed a small exclosure around a newly discovered *Portulaca sclerocarpa* in the Upper Puʻuanahulu area to protect it from goats and sheep (PEPP 2014).
- Captive propagation for genetic storage and reintroduction—
    - Between 2013 and 2019, the Volcano Rare Plant Facility (VRPF) reported propagation of 12 plants representing four individuals at South Point (Kīpuka Māmane), one individual at Upper Puʻuanahulu, and one individual at Puu Pāpapa, and held 140 plants in inventory representing three individuals at South Point and one individual at Puu Pāpapa. Currently, there are only six plants in refugia and 42 plants in inventory representing three individuals from South Point (VRPF 2013-2019).
    - In 2019, HVNP propagated 180 plants from seed and 508 plants from cuttings, representing 52 founders. In addition, 300 founders were represented by 415,000 seeds in storage (HVNP 2019a).
    - For 2019, there were more than 18,000 seeds collected representing 40 to 45 founders from 11 populations at PTA and from one population outside of PTA (U.S. Army Garrison 2020, pp. 35, 64–65). The total number of seeds in storage is currently almost 33,000. There are 508 fruit in storage collected from wild plants and 8,734 fruit collected from greenhouse plants (U.S. Army Garrison 2020, p. 36).
    - In 2019, the National Tropical Botanical Garden (NTBG) reported eight plants in a living collection at the Southshore Garden (NTBG 2019).
    - In 2018, 147 plants were propagated at Puʻuwaʻawaʻa and seven seeds collected from one wild plant at Puʻuanahulu are in storage (Puʻuwaʻawaʻa 2018).
- Reintroduction and translocation—
    - In 2020, HVNP reported reintroduction of 28 plants at Kīpuka Māmane (six survive), 525 plants at Kīlauea Crater rim (120 survive), 404 plants at "Fire Safe Sites" (203 survive), 75 plants at "Linda's" (all survive), and 231 plants at Puhimau (93 survive). In summary, of the 1,263 individuals reintroduced, 497 (39 percent) survive (HVNP 2020).
    - From 2013 to 2019, the VRPF reintroduced 86 plants to Manukā representing one individual from South Point and nine plants were sent to DLNR-DOFAW representing one individual from Puʻuanahulu (VRPF 2019).
    - In 2019, at PTA there were 391 plants being managed in seven "plant groups" (U.S. Army Garrison 2020, p. 54).
    - At Puʻuwaʻawaʻa, 144 individuals were reintroduced at Hauaina Reservoir and 144 individuals were reintroduced at Kīpuka ʻOwēʻowē (Puʻuwaʻawaʻa 2018).

- Population biology research—Eight seed germination trials (using 546 seeds) resulted in growth of 393 seedlings (U.S. Army Garrison 2020, p. 40).

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

Date	No. wild individuals	No. outplanted	Stabilization Criteria identified in Recovery Plan	Stabilization Criteria Completed?
1994 (listing)	ca 10 (Lānaʻi) 72–122 (Hawaiʻi)	0	All threats managed in all 3 populations	No
			Complete genetic storage	No
			3 populations with 50 mature individuals each	No
1996 (recovery plan)	ca 10 (Lānaʻi) >1,000 (Hawaiʻi)	0	All threats managed in all 3 populations	No
			Complete genetic storage	No
			3 populations with 50 mature individuals each	Partially
2003 (critical habitat)	ca 10 (Lānaʻi) ca 1,000 (Hawaiʻi)	0	All threats managed in all 3 populations	No
			Complete genetic storage	No
			3 populations with 50 mature individuals each	Partially
2012 (5-year review)	0 (Lānaʻi) ca 200 (Hawaiʻi)	ca 200 (Hawaiʻi)	All threats managed in all 3 populations	Partially
			Complete genetic storage	Partially

			3 populations with 50 mature individuals each	Partially
2016 (critical habitat, excluded)	0 (Lānaʻi)	0	All threats managed in all 3 populations	Partially for Lānaʻi
			Complete genetic storage	No
			3 populations with 50 mature individuals each	No
Date	**No. wild individuals**	**No. outplanted**	**Interim Criteria identified by HPPRCC**	**Interim Criteria Completed?**
2020 (5-year review)	0 (Lānaʻi); 276 mature 174 immature (Hawaiʻi)	ca 2,037; ca 1,271 survive	All threats managed in all 3 populations	Partially, wild and reintroduced populations are fenced
			Complete genetic storage	Yes
			Reproduction (i.e. viable seeds, seedlings) at all 3 populations	Unknown
			3 populations with 50 mature individuals each	Yes, long-term survivorship unknown

* 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 *Portulaca sclerocarpa* and ongoing conservation efforts.

Threat	Listing factor	Current Status	Conservation/ Management Efforts
Ungulate destruction and degradation of habitat and herbivory	A, C, D	Ongoing	Partial, exclosures at Puʻuwaʻawaʻa, PTA, and HVNP
Established ecosystem altering invasive plant	A, E	Ongoing	Partial, nonnative plant control at some populations

species degradation of habitat and competition			
Drought and landslides destruction and degradation of habitat	A	Ongoing	None
Fire destruction and degradation of habitat	A	Ongoing	Partial, fire management plans for PTA and HVNP and fire break at Pu‘uwa‘awa‘a
Climate change degradation and loss of habitat	A	Ongoing	None
Rodent predation and herbivory	C	Ongoing	None
Invertebrate predation and herbivory	C	Ongoing	None
Military training activities	E	Ongoing	Partial, PTA rare plant management plan
Low numbers	E	Ongoing	Partial, collection, propagation and reintroduction

Synthesis:
Currently, 276 mature and 174 immature wild individuals remain at 10 locations on the island of Hawai‘i. Some estimates are as high as 3,000 individuals for the island; however, more surveys are needed. The population on Po‘opo‘o Islet off of Lāna‘i is likely extirpated. A landscape-based assessment of climate change vulnerability for native plants of Hawai‘i using high resolution climate change projections was made by Fortini *et al.* (2013) and their analysis showed that *Portulaca sclerocarpa* is vulnerable to the effects of climate change. Seed and cuttings collections from wild and reintroduced individuals, propagation, and reintroduction are ongoing. More than 2,000 individuals have been reintroduced since the last 5-year review and some populations have a greater than 60 percent survival rate over two years. Reintroduced populations are provided protection from feral ungulates by fencing and ungulate control at PTA, Pu‘uwa‘awa‘a and HVNP. Recruitment of seedlings has not been reported.

Stabilizing (interim), downlisting, and delisting objectives were provided in the Recovery Plan for the Big Island Plant Cluster (USFWS 1996), 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.

Portulaca sclerocarpa is a short-lived perennial 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 should be documented on the islands of Hawai‘i and Lāna‘i where they now occur or occurred historically and each of these populations must be naturally reproducing (*i.e.,* viable seeds, seedlings, saplings) with a minimum of 50 mature, reproducing individuals per population. While it is unknown whether all of the threats are being controlled enough to not limit population growth and stability, some of them are (e.g. fencing), so we will evaluate this species at the next stage, interim stabilization, due to the presence of three populations of 50 mature individuals and the completion of genetic storage goals at this stage.

For interim stabilization goals to be met, the taxon...

The interim stabilization goals for this species have not been met. There are three populations with 50 mature reproducing individuals. The individuals on Lāna‘i are assumed to be extirpated and no individuals have been reintroduced on the islet. Genetic representation is complete for at least 45 founders with approximately 300 founders represented in seed collections (Table 1). However, all threats are not being managed (Table 1, Table 2). Therefore, *Portulaca sclerocarpa* 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 2012. Thus, the following recommendations for future actions are reiterated for the 5-year review for 2020.

- Surveys and inventories—Continue to conduct thorough surveys of all historical and suitable habitat for new occurrences. This species can be difficult to find as it is low-growing and inconspicuous when not in flower.
- Ungulate monitoring and control—Continue to construct and maintain fenced exclosures to protect individuals from the negative impacts of habitat destruction and degradation, and browsing and trampling by ungulates.
- Established ecosystem-altering invasive plant monitoring and control—Control established ecosystem-altering nonnative invasive plant species, and those that compete with *P. sclerocarpa* at all populations.
- Drought protection—Determine best reintroduction sites to reduce the impacts of drought.
- Fire protection—
    - Continue to maintain fire breaks at Pu‘uwa‘awa‘a.

    - Implement fire management plans for HVNP and Pu‘uwa‘awa‘a and develop fire management plans for other wild and reintroduced populations of *P. sclerocarpa*.
- 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.
- Predation and herbivore control—
    - Implement effective control methods for rodents.
    - Conduct research on the damaging effects of nonnative sphinx moths and if necessary, develop and implement effective control measures.
- Captive propagation for genetic storage and reintroduction—
    - Continue collection and propagation efforts for maintenance of genetic stock and for reintroduction.
    - Track maternal source of propagative materials for use in *ex situ* propagation.
    - Continue to utilize at least three different facilities for seed storage and propagation.
- Reintroduction and translocation—
    - Determine optimal sites reintroduction and recruitment success and continue to reintroduce individuals into these areas that are managed for known threats.
    - Determine suitable habitat on Lāna‘i for this species.
- Population biology research—Study the reproductive biology of *P. sclerocarpa* to determine best management practices on the islands of Hawai‘i and Lāna‘i
- Alliance and partnership development—Continue to work with the U.S. Army Garrison, the Hawai‘i Division of Forestry and Wildlife, Hawai‘i Volcanoes National Park, and other partners and land managers in planning and implementation of ecosystem-level restoration and management to benefit this 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 Hawai‘i at Hilo, Hawai‘i. 134 pp.

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

[HVNP] Hawai‘i Volcanoes National Park. 2019a. Annual report to the U.S. Fish and Wildlife Service threatened and endangered plants, Hawai‘i Volcanoes National Park TE-018078-21, 2019, 26 pp.

[HVNP] 2019b. 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.

[HVNP] 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.

[NPS] National Park Service. 2015. Hawai‘i Volcanoes National Park draft general management plan, wilderness study, and environmental impact statement. 512 pp.

[NTBG] National Tropical Botanical Garden. 2019. 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. 2014. PEPP annual report fiscal year 2014 (July 1, 2013-June 30, 2014). 185 pp.

[PEPP] 2017. Plant Extinction Prevention Program FY 2017 annual report (Oct 1, 2016-Sep 30, 2017), US FWS CFDA program #15.657; Endangered species conservation-recovery implementation funds, Cooperative Agreement F14AC00174, December 12, 2017, UH Manoa, PCSU, PEPP. 235 pp.

[PEPP] 2019. Plant Extinction Prevention Program, annual recovery subpermit FWSPIFWO-26 report (January 1st, 2018–December 31st 2018), as designated under the U.S. Endangered Species Act. Unpublished report submitted to U.S. Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office, Honolulu, Hawai‘i. 569 pp.

Pu‘uwa‘awa‘a. 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, Hawai‘i.

[USFWS] U.S. Fish and Wildlife Service. 1996. Recovery plan for the Big Island plant cluster, 1998. Portland. 201 pp. + appendices.

[USFWS] 2012. *Portulaca sclerocarpa* 5-year review summary and evaluation. USFWS Pacific Islands Fish and Wildlife Office, Honolulu, HI. *https://ecos.fws.gov/docs/five_year_review/doc4062.pdf.*

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

[USFWS] 2018. Endangered and threatened wildlife and plants; initiation of 5-year status reviews for 156 species in Oregon, Washington, Hawaii, Palau, Guam, and the Northern Mariana Islands. 88 FR 20088, May 7, 2018.

[VRPF] Volcano Rare Plant Facility. 2013-2019. Summary of reports 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.

U.S. FISH AND WILDLIFE SERVICE
SIGNATURE PAGE for 5-YEAR REVIEW of *Portulaca sclerocarpa* (po‘e)

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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