5-YEAR REVIEW

Short Form Summary

Species Reviewed: *Psychotria grandiflora* (Kōpiko)

Current Classification: Endangered

Federal Register Notice announcing initiation of this review:

[USFWS] U.S. Fish and Wildlife Service. 2020. Endangered and Threatened Wildlife and Plants; Initiation of 5-Year Status reviews for 129 Species in Oregon, Washington, Idaho, Hawaii, Montana, California, and Nevada. Federal Register 85(48): 14240–14243, March 11, 2020.

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 2021. The review was based on a review of current, available information since the last 5-year review for *Psychotria grandiflora* (USFWS 2017). 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 (*https://ecos.fws.gov/ecp/species/6855*).

Review Analysis:

Please refer to the previous 5-year review for *Psychotria grandiflora* published in the Federal Register on September 18, 2017 (available at *https://ecos.fws.gov/docs/tess/species_nonpublish/2525.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. grandiflora*.

This long-lived tree in the Rubiaceae (coffee) family is endangered and is known from the island of Kaua‘i. The status and trends for *Psychotria grandiflora* are provided in the tables below.

New Status Information:

Currently, there are approximately 78 wild individuals across 12 populations on Kaua‘i (Kishida and Perlman 2017; Plant Extinction Prevention Program [PEPP] 2021).

New Threats:

- None.

New Management Actions:

- Invasive nonnative plant management—KPEPP controls nonnative plants around 7 populations while monitoring (PEPP 2021).
- Control of predation and herbivory by rats—KPEPP conducts rat control around 5 populations (PEPP 2021)
- Collection and propagation for genetic storage and reintroduction—
  - KPEPP attempts pollination and collects mature fruit while monitoring (PEPP 2021).
  - Lyon Arboretum’s micropropagation lab maintains 19 explants representing 6 founders, and reports 19 seeds in storage representing 2 founders (Lyon Arboretum 2022).
  - National Tropical Botanical Garden (NTBG) reports 2 seeds in storage from 1 founder (NTBG 2021).
- Reintroduction and translocation—
  - KPEPP monitors 6 outplanted *Psychotria grandiflora* across from the Kalalau lookout (PEPP 2021).
- Population biology research—
  - Flowers are functionally unisexual (Wagner et al., 1999) and selfing may be limited. The species is bird-pollinated (PEPP 2016), but levels of pollination are unknown and suspected to be low due to limited fruit production. Building on the foundational research in 2016 by Dr. Kenta Watanabe at Okinawa College, KPEPP regularly conducts hand cross-pollination to increase fruit production over the last several years with success (PEPP 2021).

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

Date	No. wild individuals	No. outplanted	*Preventing Extinction Criteria identified by HPPRCC	*Preventing Extinction Criteria Completed?
2010 (listing and critical habitat)	16-30	0	All threats managed in all 3 populations	No
			Complete genetic storage	No
			3 populations with 50 mature individuals each	No
2017 (5-year review)	58	0	All threats managed in all 3 populations	Partially
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	No
2022 (5-year review)	78	6	All threats managed in all three populations	Partially
			Complete genetic storage	Partially
			Natural reproduction at all three populations	No
			Three 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 *Psychotria grandiflora* and ongoing conservation efforts.

Threat	Listing factor	Current Status	Conservation/ Management Efforts
Degradation and destruction of habitat by feral ungulates	A	Ongoing	Partially, two populations in fenced exclosures
Established ecosystem altering invasive plant species degradation of habitat	A	Ongoing	None
Climate change degradation or loss of habitat, including hurricanes	A	Ongoing	None
Predation and herbivory by ungulates	C	Ongoing	Partially, two populations in fenced exclosures
Predation and herbivory by rodents	C	Ongoing	None
Predation and herbivory by invertebrates	C	Ongoing	None
Inadequacy of existing regulatory mechanisms—Lack of adequate hunting regulations	D	Ongoing	None
Inadequacy of existing regulatory mechanisms—Lack of adequate biosecurity legislation	D	Ongoing	None
Invasive species—Established invasive plant species competition	E	Ongoing	None
Human disturbances-Hiking and fruit collections	E	Ongoing	None
Reduced viability due to low numbers	E	Ongoing	Partial, seed collections

Synthesis:
Currently, there are approximately 78 wild individuals of *Psychotria grandiflora* on Kauaʻi. Some populations are protected from ungulates by fencing and nonnative plant control. Seed collections, propagation, and outplanting are ongoing.

Stabilizing (interim), downlisting, and delisting objectives are provided in the Kauaʻi Islandwide Recovery Plan (USFWS 2021) 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.

Psychotria grandiflora is a long-lived tree that may currently behave more as an obligately outcrossing species. 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 Kaua‘i where they now occur or occurred historically and each of these populations must be naturally reproducing (i.e., viable seeds and seedlings) with a minimum of 50 mature, reproducing individuals per population.

The preventing extinction goals for this species have not been met. Genetic storage is not complete (Table 1), there are no populations totaling at least 50 reproducing individuals, and all threats are not being managed (Table 1, Table 2). Therefore, *Psychotria grandiflora* 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 2017. Thus, the following recommendations for future actions are reiterated and updated for the 5-year review for 2022.

- Surveys and inventories—
  - Survey for additional populations and individuals in known historical sites and other areas of suitable habitat.
  - 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 nonnative plant monitoring and control—Continue control of established ecosystem-altering nonnative invasive plant species, and those that compete with *Psychotria grandiflora*.
- Site and habitat protection—Develop and implement effective control measures to reduce the impact of fire.

- Fire prevention and control—Continue to develop and implement fire prevention management plans.
- Climate change adaptation strategy—Research suitability of habitat for reintroduction of this species in the future due to the impacts of climate change, including landslides.
- 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 impacts of reduced viability due to low numbers.
- 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 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.

References:

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

Kishida, W. and S. Perlman. 2017. Hawai‘i Rare Plant Restoration Group (HRPRG) Field Data Form *in* PEPP 2019: Plant Extinction Prevention Program, FY 2019 Annual Report (Oct 1, 2018-Sep 30, 2019), USFWS CFDA Program #15.657, Endangered Species Conservation-Recovery Implementation Funds, Coop Agreement F18AC00502, December 26, 2019, UH Mānoa, PCSU, PEPP. 192 pp. + appendices. BioPacifica database record for *Psychotria grandiflora*, Pacific Islands Fish and Wildlife Office.

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.

[NTBG] National Tropical Botanical Garden. 2021. 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] 2016. Hawaii Department of Land & Natural Resources, DOFAW rare plant program, section 6 interim performance report, F15AF00595, Plant Extinction

Prevention Program annual report Fiscal Year 2016 (July 1, 2015-June 30, 2016). 53 pp.

[PEPP] Plant Extinction Prevention Program. 2021. Fiscal year 2021 interim performance report (October 1, 2020-September 30, 2021) cooperative agreements F18AC00502 and F19AC00532, US Fish and Wildlife Service CFDA Program #15.657, Endangered species conservation—recovery implementation funds, University of Hawaii at Manoa, Pacific Cooperative Studies Unit, Plant Extinction Prevention Program.

[USFWS] U.S. Fish and Wildlife Service. 2017. *Psychotria grandiflora* 5-year review summary and evaluation. USFWS Pacific Islands Fish and Wildlife Office, Honolulu, HI. *https://ecos.fws.gov/docs/five_year_review/doc2525.pdf.*

[USFWS] 2020. Endangered and threatened wildlife and plants; initiation of 5-year status reviews for 129 Species in Oregon, Washington, Idaho, Hawaii, Montana, California, and Nevada. Federal Register 85(48): 14240–14243, March 11, 2020.

[USFWS] 2021. Kaua‘i Islandwide Recovery Plan. U.S. Fish and Wildlife Service, Portland, OR. 65 pp. + appendices.

Wagner, W.L., D.R. Herbst, and S.H. Sohmer. 1999. 96. Rubiaceae, coffee family. In Manual of the Flowering Plants of Hawaii, Wagner, W.L., D.R. Herbst, and S.H. Sohmer (eds.), University of Hawaii Press and Bishop Museum Press. Pp. 1111–1174.

U.S. FISH AND WILDLIFE SERVICE
SIGNATURE PAGE for 5-YEAR REVIEW of *Psychotria grandiflora* (Kōpiko)

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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