

5-YEAR REVIEW

Short Form Summary

Species Reviewed: *Myrsine knudsenii* (kōlea)

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:

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 or USFWS) beginning in October 2021. The review was based on a review of current, available information since the last 5-year review for *Myrsine knudsenii* (USFWS 2017). 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 (<https://ecos.fws.gov/ecp/species/8957>).

Review Analysis:

Please refer to the previous 5-year review for *Myrsine knudsenii* published in the Federal Register on September 16, 2017 (available at http://ecos.fws.gov/docs/tess/species_nonpublish/2478.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 *M. knudsenii*.

This short-lived perennial shrub in the Primulaceae (primrose) family is listed as endangered and is known from the island of Kaua‘i. The status and trends for *Myrsine knudsenii* are provided in the tables below.

New Status Information:

- Currently, there are seven subpopulations of *Myrsine knudsenii* totaling 60 individuals on Kaua‘i (Heintzman et al. 2020).
- In 2015, the Service published a report updating species taxonomy and other technical corrections, including updating plant family reassignments. The family Myrsinaceae is now revised to Primulaceae for *Myrsine knudsenii* (80 FR 35860, June 23, 2015). This change is also accepted in Wagner *et al.* (2012) and by the Angiosperm Phylogeny Group (2009) and does not affect the range or status of *M. knudsenii*.

New Threats:

- None reported.

New Management Actions:

- Surveys and monitoring—The National Tropical Botanical Garden (NTBG) and the Plant Extinction Prevention Program (PEPP) monitor and survey for populations of *Myrsine knudsenii* on Kaua‘i (Kishida and Williams 2016; Kishida et al. 2018a; PEPP 2017; PEPP 2021).
- Ungulate monitoring and management—Two small exclosures protect reintroductions (Kishida et al. 2018b, 2018c).
- Invasive nonnative plant management—The State’s Natural Area Reserves system controls nonnative plants at Miloli‘i (Kishida et al. 2018b). The State also manages a small exclosure for reintroductions (Kishida and Williams 2016).
- Captive propagation for genetic storage and reintroduction—
 - PEPP collects fruit for storage and propagation (Perlman 2017, 2018, 2019a, b; KPEPP 2021).
 - In 2022, the Lyon Arboretum Micropropagation Laboratory reported propagation and storage of 106 explants representing eight founders from two populations at Honopū and Awa‘awapuhi (Lyon Arboretum 2022). The Arboretum’s Seed Conservation Laboratory reported storage of 181 seeds representing 12 founders from Awa‘awapuhi and storage of 454 seeds representing three founders from Honopū (Lyon Arboretum 2022).
 - In 2019, the Kōke‘e Mid-Elevation Nursery (KMEN) reported propagation of three plants representing one founder from Honopū and Awa‘awapuhi and six plants representing three founders were propagated for reintroduction to an exclosure at Kalalau (KMEN 2019). In 2021, KMEN reported propagation of 14 plants representing a third founder at Awa‘awapuhi (KMEN 2021).
 - In 2019, NTBG propagated seven plants for addition to the living collection at Limahuli (NTBG 2019). In 2017, NTBG stored 13 seeds representing one founder from Awa‘awapuhi. In 2018, NTBG stored 145 seeds representing one founder from Honopū, and an additional 12 seeds from Awa‘awapuhi (NTBG 2020).
- Reintroduction and augmentation—In 2018, PEPP reintroduced 11 plants to an exclosure at Kalalau and 10 individuals to an exclosure at Miloli‘i (Kishida et al. 2018b; Kishida et al. 2018c).

Table 1. Status and trends of *Myrsine knudsenii* 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)	30	0	All threats managed in all 3 populations	No
			Complete genetic storage	No
			3 populations with 100 mature individuals each	No
2017 (5-year review)	40		All threats managed in all 3 populations	Partially
art			Complete genetic storage	Partially
			Reproduction (i.e., viable seeds, seedlings) at all 3 populations	Unknown
			3 populations with 100 mature individuals each	No
2022 (5-year review)	60	21	All threats managed in all 3 populations	Partially, small managed enclosure for reintroductions
			Complete genetic storage	Partially, ca 15 founders from 2 populations represented
			Natural reproduction at all 3 populations	Unknown
			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 *Myrsine knudsenii* and ongoing conservation efforts.

Threat	Listing factor	Current Status	Conservation/ Management Efforts
Degradation and destruction of habitat by feral ungulates	A	Ongoing	Partial, 1 exclosure for reintroductions
Established ecosystem altering invasive plant species degradation of habitat and competition	A, E	Ongoing	Partial, 1 exclosure for reintroductions
Climate change degradation and destruction of habitat, including hurricanes	A	Ongoing	None
Rodent predation and herbivory	C	Ongoing	None
Inadequacy of exiting regulatory mechanisms—lack of adequate hunting and biosecurity legislation	D	Ongoing	None
Reduced viability due to low numbers	E	Ongoing	Partial, collection, propagation, and reintroductions

Synthesis:

Currently, there are 60 wild individuals of *Myrsine knudsenii* on Kaua‘i. Two reintroduced populations are within managed exclosures. Seed collection, propagation, and reintroduction are ongoing. Fifteen founders from two populations are represented *ex situ*.

Stabilizing (interim), downlisting, and delisting objectives are provided in the Kaua‘i 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.

Myrsine knudsenii 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 Kaua‘i where this species now occurs

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 *Myrsine knudsenii* have not been met. There are only 60 known wild individuals (Table 1). Collection and propagation are ongoing, with 15 founders from two populations represented (Table 1). Only two reintroduced populations are provided protection by managed exclosures (Table 1, Table 2). This species is susceptible to the effects of feral ungulates, nonnative plant competition, rodent predation and herbivory, climate change, hurricanes, inadequate biosecurity, and reduced viability due to small population size (Table 2). Therefore, *M. knudsenii* meets the definition of Endangered as it remains in danger of extinction throughout its range.

Recommendations for Future Actions:

No new threats and no significant new information regarding the species' biological status have 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 monitoring—Continue to survey for populations of *Myrsine knudsenii* in areas of potentially suitable habitat and monitor known populations to determine their current status.
- Ungulate monitoring and control—Continue to construct and maintain exclosures to protect all occurrences from habitat disturbance by feral ungulates.
- Nonnative invasive plant monitoring and control—Control established ecosystem-altering nonnative invasive plant species and those that compete with *M. knudsenii* at all populations.
- Predator and herbivore monitoring and control—Implement effective control measures for rats at all populations.
- Climate change adaptation strategy—Research suitability of habitat for viability of species, including where to conduct translocations in the future due to impacts of climate change.
- Captive propagation for genetic storage and reintroduction—Continue collection and storage of seeds and propagules for maintenance of genetic stock.
- Reintroduction and augmentation—Continue to reintroduce individuals into protected suitable habitat that is being managed for known threats to this species.
- Build resiliency and redundancy—Increase numbers of individuals and populations to reduce impacts of predation, low numbers, climate change, and hurricanes.
- Population biology research—Study *M. knudsenii* populations to determine viable 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—Continue to work with partners and other land managers in planning and implementation of ecosystem-level restoration and management to benefit this species.

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- [HPPRCC] Hawai‘i and Pacific Plants Recovery Coordinating Committee. 2011. Revised recovery objective guidelines. 8 pp.
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[KMEN] Kōke'e Mid-Elevation Nursery. 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.

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U.S. FISH AND WILDLIFE SERVICE
SIGNATURE PAGE for 5-YEAR REVIEW of *Myrsine knudsenii* (kōlea)

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

_____ Date _____