

5-YEAR REVIEW

Short Form Summary

Species Reviewed: *Brighamia insignis* (‘ōlulu)

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) beginning in October 2021. The review was based on a review of current, available information since the last 5-year review for *Brighamia insignis* (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/1615>).

Review Analysis:

Please refer to the previous 5-year reviews for *Brighamia insignis* published in the Federal Register on January 18, 2008, and September 13, 2017 (available at https://ecos.fws.gov/docs/tess/species_nonpublish/1142.pdf https://ecos.fws.gov/docs/tess/species_nonpublish/2413.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 *B. insignis*.

This short-lived perennial shrub in the Campanulaceae (bellflower) family is endangered and is known from the island of Kaua‘i. The status and trends for *Brighamia insignis* are provided in the tables below.

New Status Information:

- Currently, there are no known wild individuals of *Brighamia insignis* on Kaua'i (DeMotta 2020, p. 4; Wood in DeMotta 2020, Appendix 1, p. 10).

New Threats:

- None reported.

New Management Actions:

- Monitoring and surveys—The National Tropical Botanical Garden (NTBG) continues to monitor past locations of *Brighamia insignis* on Kaua'i for any wild individuals (DeMotta 2020, p. 4; Wood in DeMotta 2020, Appendix 1, p. 10).
- Invasive nonnative plant management—Nonnative invasive plants are being controlled at Mt. Hā'upu near the area of an historic occurrence of *B. insignis*, including control of the four significant invasive species *Melastoma septemnerium* (Asian melastome), *Heliocarpus popayanensis* (moho), *Schinus terebinthifolius* (Christmas berry), and *Psidium cattleianum* (strawberry guava) (DeMotta 2020, p. 6).
- Captive propagation for genetic storage and reintroduction—
 - In 2020, the Lyon Arboretum Micropropagation Laboratory reported 125 explants in storage representing more than 10 collections from at least three founders at Ho'olulu (Lyon Arboretum 2020). In 2022, four additional plants representing two of those founders at Ho'olulu were reported, with an additional 24 explants representing one plant in cultivation at NTBG (Lyon Arboretum 2022). The Lyon Arboretum Seed Laboratory reported 8,618 seeds in storage representing three plants in cultivation at NTBG gardens, all collected in 1999, 2015, and 2017 (Lyon Arboretum 2022).
 - In 2017, NTBG reported storage of 432 seeds from five plants in a living collection representing two founders from Na Pali. In 2018, 1,230 seeds were in storage from plants representing three founders from Ho'olulu and 18 propagules representing two founders from Ho'olulu. In 2020, NTBG reported three individuals in propagation (from an unspecified source) and in 2021, there were a total of 14,402 seeds in storage for use in research (from unspecified sources) (NTBG 2020).
- Reintroduction and augmentation—In 2018, NTBG reintroduced 16 individuals to Limahuli representing two founders from Ho'olulu (NTBG 2020).
- Pollination biology research—The results of a study in 2019 of the floral biology of *Brighamia insignis* showed that flowers provide sucrose-rich nectar and emit a strong floral scent, and along with other physical characteristics, suggest moth pollination. Only nonnative invertebrate species were observed to visit flowers and with fewer than 10 percent of the available flowers visited, are likely not effective pollinators. Pollination treatments (hand pollination and outcrossing) were inconclusive because of the small number of fruits formed, although outcrossing produced higher seed counts. Researchers concluded that without insect assisted outcrossing, *B. insignis* may not recover in the wild (Walsh et al. 2019, entire).

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

Date	No. wild individuals	No. outplanted	Stability Criteria identified in Recovery Plan	Stability Criteria Completed?
1994 (listing)	<40	0	All threats managed in all 3 populations	No
			Complete genetic storage	No
			3 populations with 50 mature individuals each	No
1995 (recovery plan)	42–62	0	All threats managed in all 3 populations	No
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	No
2003 (critical habitat)	42–62		All threats managed in all 3 populations	No
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	No
2008 (5-year review)	1	0	All threats managed in all 3 populations	No
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	No
Date	No. wild individuals	No. outplanted	*Preventing Extinction Criteria identified by HPPRCC	*Preventing Extinction Criteria Completed?
2017 (5-year review)	0	0	All threats managed in all 3 populations	No
			Complete genetic storage	Yes

			Reproduction (i.e., viable seeds, seedlings) at all 3 populations	No
			3 populations with 100 mature individuals each	No
2022 (5-year review)	0	16	All threats managed in all 3 populations	Partially
			Complete genetic storage	Yes
			Natural reproduction at all 3 populations	No
			3 populations with 100 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 *Brighamia insignis* and ongoing conservation efforts.

Threat	Listing factor	Current Status	Conservation/ Management Efforts
Degradation and destruction of habitat by feral ungulates	A	Ongoing	Partial, some control at reintroduction site
Established ecosystem altering invasive plant species degradation and destruction of habitat	A	Ongoing	Partial, some nonnative plant control
Landslide destruction and degradation of habitat	A	Ongoing	None
Climate change degradation or loss of habitat, including hurricanes	A	Ongoing	None
Predation and herbivory by feral ungulates	C	Ongoing	Partial, some control at reintroduction site
Predation and herbivory by rats	C	Ongoing	None
Reduced viability due to low numbers	E	Ongoing	Partial, seed storage, propagation, and reintroduction

Synthesis:

Currently there are no known wild individuals of *Brighamia insignis* on Kaua‘i. Seed collections represent at least three founders from Ho‘olulu and three plants in living collections at the NTBG gardens. Reintroduction is ongoing at Limahuli, representing two of the founders from Ho‘olulu. Some nonnative invasive plant control is ongoing at historical and reintroduction locations.

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.

Brighamia insignis is a short-lived perennial shrub and an obligate outcrosser. 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 100 mature, reproducing individuals per population.

The preventing extinction goals for this species have not been met. Although genetic storage is complete, wild populations continued to decline and currently there are no known wild individuals (Table 1). A small number of individuals (16) were recently reintroduced (Table 2). In addition, all threats are not being managed (Table 1, Table 2). Therefore, *Brighamia insignis* 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 or updated for the 5-year review for 2022.

- Surveys and inventories—Survey for populations of *Brighamia insignis* in areas of potentially suitable habitat.

- Ungulate monitoring and control—Determine management needs of the immediate areas of the last known wild individuals and outplanted individuals to provide protection from feral ungulates.
- Climate change adaptation strategy—Research suitability of habitat for reintroduction of this species in the future due to the impacts of climate change.
- Predator and herbivore monitoring and control—Implement effective control methods for rats at outplanted and any new wild populations.
- Captive propagation for genetic storage and reintroduction—
 - Continue collection and propagation efforts when materials are available for maintenance of genetic stock and for reintroduction.
 - Continue to conduct hand pollination for outcrossing and adequate genetic representation.
- Reintroduction and augmentation—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 and to reduce impacts of hurricanes and landslides.
- Pollination biology research—Conduct a more detailed genetic study of propagules from wild and outplanted sources to determine suitable materials for using in hand pollination (outcrossing) efforts.
- 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.

DeMotta, M. 2020, USFWS Partners Program, Mt. Hā‘upu Conservation Project, Service Award #F18AC00511, Interim Performance and Financial Report, Oct 1, 2019-Sept 30, 2020. Pp. 4, 6.

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- [USFWS] 2021. Kaua‘i Islandwide Recovery Plan. U.S. Fish and Wildlife Service, Portland, OR. 65 pp. + appendices.
- Walsh, S., R.J. Pender, R.R. Junker, C.C. Daehler, C.W. Morden, and D.H. Lorence. 2019. Pollination biology reveals challenges to restoring populations of *Brighamia insignis* (Campanulaceae), a critically endangered plant species from Hawaii. *Flora* 259 (2019) 151448, www.elsevier.com/locate/flora.
- Wood, K. in DeMotta, M. 2020. Appendix 1. USFWS Partners Program, Mt. Hā‘upu Conservation Project, Service Award #F18AC00511, Interim Performance and Financial Report, Oct 1, 2019-Sept 30, 2020. P. 10.

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SIGNATURE PAGE for 5-YEAR REVIEW of *Brighamia insignis* (‘ōlulu)

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
- No Change in listing status

For Field Supervisor, Pacific Islands Fish and Wildlife Office

_____ Date _____