5-YEAR REVIEW

Short Form Summary

Species Reviewed: *Brighamia rockii* (pua‘ala)

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, Acting 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 *Brighamia rockii* (USFWS 2018). The evaluation by Cheryl Phillipson, Biologist, was reviewed by Lauren Weisenberger, Plant Recovery Coordinator, and Acting 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/8393*).

Review Analysis:

Please refer to the previous 5-year reviews for *Brighamia rockii* published in the Federal Register on January 18, 2008, March 11, 2014, and October 22, 2018 (available at *https://ecos.fws.gov/docs/tess/species_nonpublish/1143.pdf*, *https://ecos.fws.gov/docs/tess/species_nonpublish/2178.pdf*, and *https://ecos.fws.gov/docs/tess/species_nonpublish/2613.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. rockii*.

This long-lived perennial stem succulent in the Campanulaceae (bellflower) family is endangered and is known from Moloka‘i and historically from Maui and Lāna‘i. The status and trends for *Brighamia rockii* are provided in the tables below.

New Status Information:

- In 2018, there was one wild population on Moloka‘i totaling approximately 45 individuals. In multiple helicopter surveys in 2021, approximately 11 individuals were observed on Moloka‘i (Bakutis 2021, pers. comm. in Walsh et al. 2022).
- There are approximately seven founders (maternal lines) in *ex situ* storage and propagation (Lyon Arboretum 2022; Olinda Rare Plant Facility [ORPF] 2019, 2020, 2023).

New Threats:

- None reported.

New Management Actions:

- Monitoring and surveys—The Plant Extinction Prevention Program (PEPP) monitors and removes nonnative plants at the translocation sites at Kalaupapa and the offshore islands of Mōkapu and ‘Ōkala (PEPP 2018; Walsh et al. 2021).
- Collection and propagation for genetic storage and translocation—
    - The Lyon Arboretum Micropropagation Laboratory reported storage of 62 explants representing 4 founders from Waiehu and 32 explants representing 1 founder from Waiohookalo, with 12 explants stored representing a founder of unknown origin (Lyon Arboretum 2021). In 2021, the Lyon Arboretum Seed Conservation Laboratory reported collection and storage of 144 seeds representing one founder from Waiohookalo, 2,569 seeds representing one first-generation plant from an outplanting site at Kalaupapa, and 1,388 seeds stored representing another first-generation plant also from the outplanting site at Kalaupapa (Lyon Arboretum 2022). In 2021, 45 seeds were in storage representing 1 founder at Huelo and 55 seeds representing a cultivated plant sourced from Huelo. Fifty seeds were stored representing a founder at Waiehu with 100 seeds representing a cultivated plant source from Waiehu (Lyon Arboretum 2022).
    - In 2019, the National Tropical Botanical Garden (NTBG) reported 25 plants and 2,743 seeds in storage representing a third-generation plant sourced from Huelo. In 2021, NTBG reported storage of 315 seeds representing first- and second-generation plants grown at their Kahanu Garden on Maui, sourced from Waiehu and Huelo founders (NTBG 2021).
    - In 2019, the Olinda Rare Plant Facility (ORPF) reported 98 potted plants in the nursery representing 4 founders from Waiehu, 143 potted plants representing one founder at ‘Ōkala Island, and 6 potted plants representing one translocated plant at Kalaupapa (ORPF 2019). In 2022, ORPF reported 12 potted plants in storage representing one founder from Waiehu (ORPF 2023).
    - PEPP hand pollinates and collects fruit from translocated plants at the Kalaupapa reintroduction site (PEPP 2018, pp. 19–20; PEPP 2020a, p. 10; PEPP 2021, p. 9; PEPP 2022, p. 16). In 2021, PEPP observed successful natural pollination and fruit production at one location (PEPP 2021, p. 9).
- Translocation and augmentation—In 2019, PEPP reported translocation of 95 plants and an additional 321 plants in 2020. All 13 individuals translocated to ‘Ōkala were destroyed by rat predation; PEPP will discontinue reintroduction

efforts on this island until after rats are controlled (PEPP 2020b, pp. 14–15, PEPP 2022, pp. 19, 26).

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

Date	No. wild individuals	No. outplanted	Stability Criteria identified in Recovery Plan	Stability Criteria Completed?
1992 (listing)	<200	0	All threats managed in all 3 populations	No
			Complete genetic storage	No
			3 populations with 25 mature individuals each	No
2008 (5-year review)	1	3	All threats managed in all 3 populations	No
			Complete genetic storage	Yes
			3 populations with 25 mature individuals each	No
2014 (5-year review)	34	95	All threats managed at all 3 populations	No
			Complete genetic storage	Partially
			3 populations with 25 mature individuals each	No
Date	**No. wild individuals**	**No. outplanted**	***Preventing Extinction Criteria identified by HPPRCC**	***Preventing Extinction Criteria Completed?**
2018 (5-year review)	45	ca 160	All threats managed in all 3 populations	No
			Reproduction (i.e., viable seeds, seedlings, saplings) at all 3 populations	No

			Complete genetic storage	Yes
			3 populations with 50 mature individuals each	No
2023 (5-year review)	11	>400; 1 population (13) documented as destroyed by rats	All threats managed in all 3 populations	Partially, 1 translocated population in exclosure
			Complete genetic storage	Partial, 7 founders represented
			Natural reproduction at all 3 populations	Partially, natural recruitment observed at 1 translocated population
			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 *Brighamia rockii* and ongoing conservation efforts.

Threat	Listing factor	Current Status	Conservation/ Management Efforts
Degradation and destruction of habitat by feral ungulates	A	Ongoing	Partial, 1 translocated population in exclosure
Established ecosystem altering invasive plant species degradation of habitat and competition	A, E	Ongoing	Partial, nonnative plant control within exclosure and on offshore islands
Landslides and flooding destruction and degradation of habitat	A	Ongoing	None
Climate change degradation or loss of habitat	A	Ongoing	None
Predation and herbivory by feral ungulates	C	Ongoing	Partial, 1 translocated population in exclosure

Predation and herbivory by rodents	C	Ongoing	Partial, rats removed from 1 offshore island
Predation and herbivory by invertebrates	C	Ongoing	None
Reduced viability due to low numbers	E	Ongoing	Partial, propagation, seed storage, and translocation efforts are ongoing

Synthesis:
In 2018, there were approximately 45 mature wild individuals of *Brighamia rockii* on Molokaʻi. Approximately 11 individuals were observed in 2021. Seed collections from wild and translocated plants and propagation of greenhouse materials are ongoing. Seven founders from 3 populations are represented in collections. Currently, more than 400 individuals have been propagated and translocated; however, predation by rats is an ongoing threat.

Stabilizing (interim), downlisting, and delisting objectives are provided in the Recovery Plan for the Molokaʻi Plant Cluster (USFWS 1996) and have been updated according to the draft revised recovery objective guidelines developed by the Hawaiʻi 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 rockii is a long-lived perennial stem succulent 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 Molokaʻi and at least one other island where they now occur or occurred historically. 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 there are no populations of at least 50 reproducing individuals and plants occur on only one island (Table 1). Only 7 of 11 known founders are represented in collections (Table 1). Not all threats are being managed (Table 2). Therefore, *Brighamia rockii* 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 updated or reiterated for the 5-year review for 2023.

- Surveys and monitoring—Survey for additional populations of *Brighamia rockii* in areas of potentially suitable habitat.
- Ungulate monitoring and control—Continue to construct fenced exclosures and strategic fencing to protect individuals from the negative impacts of habitat destruction and degradation and browsing by ungulates.
- Invasive nonnative plant monitoring and control—Continue control of established ecosystem-altering nonnative invasive plant species, and those that compete with *B. rockii* within and around all wild and translocated populations.
- Climate change adaptation strategy—Research suitability of habitat for viability of species, including where to conduct translocations in the future due to the impacts of climate change.
- Predator and herbivore monitoring and control—Implement effective control methods for rodents and slugs within wild and translocated populations of *B. rockii.*
- Captive propagation for genetic storage and reintroduction—
    - Continue collection and propagation efforts for maintenance of genetic stock and for reintroduction.
    - Evaluate genetic resources currently in storage to determine the need for long-term storage due to this species' vulnerability to climate change.
- Reintroduction and translocation—Continue to reintroduce individuals into suitable habitat within historic range that is being managed for known threats to this species.
- Build resiliency, redundancy, and representation—Increase numbers of populations and individuals throughout historic range to reduce impacts of landslides, flooding, and low numbers.
- 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:

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

Lyon Arboretum. 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.

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[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.

[ORPF] Olinda Rare Plant Facility. 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.

[ORPF] 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.

[ORPF] 2023. 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. 2018. Plant Extinction Prevention Program, fiscal year 2018 interim performance report (October 1, 2017-September 30, 2018) cooperative agreement F14AC00174, 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. 49 pp.

[PEPP] 2020a. Plant Extinction Prevention Program fiscal year 2020 interim performance report (October 1, 2019-September 30, 2020), Cooperative Agreement F18AC00502 (Interim report), F19AC00532 (Interim report), U.S. Fish and Wildlife Service CFDA Program #15.657 Endangered Species Conservation—Recovery Implementation Funds, University of Hawai‘i at Mānoa, Pacific Cooperative Studies Unit, Plant Extinction Prevention Program. 70 pp.

[PEPP] 2020b. Plant Extinction Prevention Program final report (October 1, 2018-September 30, 2019), U.S. Fish and Wildlife Service Coast Program, Catalog of Federal Domestic Assistance (CFDA) # 15.630, Award #F17AC00452, Pacific Cooperative Studies Unit, University of Hawaii, Honolulu. 26 pp.

[PEPP] 2021. Plant Extinction Prevention Program fiscal year 2021 interim performance report (October 1, 2020-September 30, 2021), Cooperative Agreement F19AC00532 (Interim report), U.S. Fish and Wildlife Service CFDA Program #15.657 Endangered Species Conservation—Recovery Implementation Funds, University of Hawai‘i at Mānoa, Pacific Cooperative Studies Unit, Plant Extinction Prevention Program. 46 pp.

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[USFWS] U.S. Fish and Wildlife Service. 1996. Recovery plan for the Moloka‘i plant cluster (Hawai‘i). Portland. 143 pp.

[USFWS] 2008. *Brighamia rockii* 5-year review summary and evaluation. USFWS Pacific Islands Fish and Wildlife Office, Honolulu, HI. *https://ecos.fws.gov/docs/tess/species_nonpublish/1143.pdf.*

[USFWS] 2014. *Brighamia rockii* 5-year review summary and evaluation. USFWS Pacific Islands Fish and Wildlife Office, Honolulu, HI. *https://ecos.fws.gov/docs/tess/species_nonpublish/2178.pdf.*

[USFWS] 2018. *Brighamia rockii* 5-year review summary and evaluation. USFWS Pacific Islands Fish and Wildlife Office, Honolulu, HI. *https://ecos.fws.gov/docs/tess/species_nonpublish/2613.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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U.S. FISH AND WILDLIFE SERVICE
SIGNATURE PAGE for 5-YEAR REVIEW of *Brighamia rockii*
(pua‘ala)

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**

LAUREN WEISENBERGER

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