

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. 2012. Endangered and threatened wildlife and plants; 5-year status reviews of 46 species in Idaho, Oregon, Washington, Nevada, Montana, Hawaii, Guam, and the Northern Mariana Islands. Federal Register 77(44):13248-13251.

Lead Region/Field Office:

Region 1/Pacific Islands Fish and Wildlife Office (PIFWO), Honolulu, Hawaii

Name of Reviewer(s):

Chelsie Javar-Salas, Plant Biologist, PIFWO
Maui nui and Hawaii Island Team Manager, PIFWO
Marie Bruegmann, Plant Recovery Coordinator, PIFWO
Recovery Program Lead, PIFWO
Kristi Young, Programmatic Deputy Field Supervisor, PIFWO

Methodology used to complete this 5-year review:

This review was conducted by staff of the Pacific Islands Fish and Wildlife Office of the U.S. Fish and Wildlife Service (USFWS), beginning on March 6, 2012. The review was based on a review of current, available information since the last 5-year review for *Brighamia rockii* (USFWS 2008). The evaluation of Chelsie Javar-Salas, Plant Biologist, was reviewed by the Island Team Manager, and Plant Recovery Coordinator, followed by the Recovery Program Lead. It was subsequently reviewed and approved by the Programmatic Deputy Field Supervisor

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 *Brighamia rockii* published on January 18, 2008, (available at http://ecos.fws.gov/docs/five_year_review/doc1768.pdf) for a complete review of the species' status, threats, and management efforts. No significant new information regarding the species' biological status has come to light since listing to warrant a change in the Federal listing status of *B. rockii*.

This long-lived perennial unbranched plant is endangered and occurred historically on the islands of Molokai, Maui, and Lanai. It is currently only found on Molokai. The current status and trends for *Brighamia rockii* are provided in the tables below.

New status information:

In addition to those populations cited in the previous 5-year review, new observations include the following:

- The Plant Extinction Prevention Program (2010) reported three wild populations with a total of approximately 37 individuals of *B. rockii* on Molokai.
- In the proposed listing and critical habitat rule, there were three wild populations totaling six individuals on Molokai in the coastal and wet cliff ecosystem (USFWS 2012).
- In 2012, there were three wild populations with a total of 34 individuals of *B. rockii* on Molokai (Plant Extinction Prevention Program [PEPP] 2012).

The difference in the number of individuals reported in the proposed rule and the Plant Extinction Prevention Program above, relates to the source of information used to prepare the proposed rule. The Plant Extinction Prevention Program report for 2012 was not used to determine the status of *B. rockii* at the time of the proposed rule publication. Overall, the numbers of individuals have increased from a single individual reported in the previous 5-year review to approximately 34 wild individuals in 2012 (PEPP 2012).

New threats:

- Climate change destruction 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 Hawaii 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 *Brighamia rockii* is highly vulnerable to the impacts of climate change. Therefore, additional management actions are needed to conserve this taxon into the future.

New management actions:

- Captive propagation for genetic storage and reintroduction
 - In 2013, the Lyon Arboretum Seed Conservation Lab had more than 4,900 seeds of *B. rockii* in storage (Harold L. Lyon Arboretum Seed Conservation Laboratory 2013).
 - Maui Nui Botanical Gardens (2013) has 142 individuals propagated at their nursery and several thousand seeds in storage.
 - Waimea Valley Arboretum has three individuals of *B. rockii* in its nursery propagated from a Molokai source population (Waimea Valley 2013).
- Ungulate monitoring and control – A fence was constructed around the outplantings at Kalaupapa National Historical Park, however goats were able to breach the fence in 2011 (PEPP 2012).
- Invasive plant monitoring and control – Weeds were controlled by the Plant Extinction Prevention Program (2012) at the outplanted site near the Kalaupapa Trail Head.
- Surveys / inventories – Aerial and ground surveys of historical locations were conducted on Molokai by the Plant Extinction Prevention Program (2010, 2011).
- Reintroduction / translocation

- Twenty-five individuals were outplanted near the Kalaupapa Trail Head (PEPP 2010). An additional 40 individuals were outplanted in November 2010 and January 2011 (PEPP 2011).
- The Kalaupapa National Historical Park outplanted 30 individuals of *B. rockii* within the Park (PEPP 2010).
- Fourteen individuals were outplanted at Kukaiwaa by the Plant Extinction Prevention Program (2013). These plants were propagated from nursery stock propagules by Bill Garnett.
- The Plant Extinction Prevention Program (2013) outplanted 14 individuals at Kaholaiki propagated from nursery stock propagules by Bill Garnett.
- Population viability monitoring and analysis
 - The Plant Extinction Prevention Program (2011, 2012) monitored the outplantings at Kalaupapa National Historical Park and the Kalaupapa Trail Head.
 - The wild populations of *B. rockii* located on the sea cliffs of Molokai were monitored by helicopter (PEPP 2010, 2011).
- Listing and critical habitat designation – Eleven units of unoccupied areas of critical habitat for *B. rockii* was proposed in the coastal ecosystem units on Maui and 10 units of occupied and unoccupied areas in the coastal and wet cliff ecosystem units on Molokai (USFWS 2012). On Lanai, critical habitat for *B. rockii* is proposed for three units of unoccupied areas in the dry cliff ecosystem unit. The final rule for critical habitat designations has not been published at the time of this review.

Synthesis:

Stabilizing, downlisting, and delisting objectives are provided in the recovery plan for the Molokai plant cluster (USFWS 1996), based on whether the species is an annual, a short-lived perennial (fewer than 10 years), or a long-lived perennial. *Brighamia rockii* is a long-lived perennial, and to be considered stable, this species must be managed to control threats (e.g. fenced) and be represented in an *ex situ* (at other than the plant's natural location, such as a nursery or arboretum) collection. In addition, a minimum of three populations should be documented on Molokai where it now occurs and if possible at least one other island where it occurred historically (Lanai or Maui). Each of these populations must be naturally reproducing and increasing in number, with a minimum of 25 mature individuals per population.

The interim stabilization goals for this species have not been met, since only one population of 25 or more mature individuals exists (Table 1) and all threats are not being sufficiently managed throughout all of the populations (Table 2). Therefore, *Brighamia rockii* meets the definition of endangered, as it remains in danger of extinction throughout its range.

Recommendations for future actions:

- Surveys / inventories – Survey geographical and historical range for a current assessment of the species' status.
- Captive propagation genetic storage and reintroduction
 - Continue collection of genetic resources for storage, propagation, and reintroduction into protected suitable habitat within historical range.

- Evaluate genetic resources currently in storage to determine the need to place additional genetic resources in long-term storage due to this species' high vulnerability to climate change.
- Ungulate monitoring and control – Fence remaining populations to protect them from the impacts of feral ungulates.
- Invasive plant monitoring and control – Eradicate invasive introduced plant species within ungulate exclosures and maintain the exclosures free of invasive introduced plants.
- Predator / herbivore monitoring and control – Control slugs and rodents within the vicinity of all known *Brighamia rockii* populations.
- Climate change adaptation strategy – Research the suitability of habitat for reintroducing this species in the future due to the impacts of climate change.
- Population viability monitoring and analysis – Continue monitoring wild and outplanted individuals.
- Alliance and partnership development – Initiate planning and contribute to implementation of ecosystem-level restoration and management to benefit this taxon.

Table 1. Trends of *Brighamia rockii* from listing through current 5-year review.

Date	No. wild indivs	No. outplanted	Stabilization Criteria identified in Recovery Plan	Stabilization Criteria Completed?
1994 (listing)	Fewer than 200	0	All threats managed in all 3 populations	No
			Complete genetic storage	No
			3 populations with 25 mature individuals each	No
1996 (recovery plan)	Fewer than 200	0	All threats managed in all 3 populations	No
			Complete genetic storage	No
			3 populations with 25 mature individuals each	No
2003 (critical habitat)	121-131	Unknown	All threats managed in all 3 populations	No
			Complete genetic storage	Unknown
			3 populations with 25 mature individuals each	No
2007 (5-yr review)	1	3	All threats managed in all 3 populations	No
			Complete genetic storage	Yes
			3 populations with 25 mature individuals each	No
2012 (critical habitat – proposed)	6 (Molokai only)	Unknown	All threats managed in all 3 populations	No
			Complete genetic storage	Unknown
			3 populations with 25 mature individuals each	No
2014 (5-yr review)	34	95	All threats managed in all 3 populations	No
			Complete genetic storage	Partially
			3 populations with 25 mature individuals each	No

Table 2. Threats to *Brighamia rockii* and ongoing conservation efforts.

Threat	Listing factor	Current Status	Conservation/ Management Efforts
Ungulates – degradation of habitat and herbivory	A, C, D, E	Ongoing	Partially, only one outplanted population is fenced
Invasive introduced plants	A, E	Ongoing	Partially, weeds controlled at the Kalaupapa trail head
Landslides and flooding	A	Ongoing	None
Rodent predation or herbivory – rats	C	Ongoing	None
Slugs herbivory	C	Ongoing	None
Reduced viability due to low numbers	E	Ongoing	Partially, captive propagation for genetic storage and reintroduction
Climate change	A, E	Increasing	None

References:

See previous 5-year review for a full list of references (USFWS 2008). Only references for new information are provided below.

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 Hawaii at Hilo, Hawaii. 141 pages.

Harold L. Lyon Arboretum Seed Conservation Laboratory. 2013. Seed storage database. University of Hawaii at Manoa, Honolulu, Hawaii. Unpublished.

Maui Nui Botanical Gardens. 2013. Report on controlled propagation of listed and candidate species, as designated under the U.S. Endangered Species Act. 12 pages. Unpublished.

[PEPP] Plant Extinction Prevention Program. 2010. Plant Extinction Prevention Program annual report, fiscal year 2010 (July 1, 2009-June 30, 2010). 122 pages. Unpublished.

[PEPP] Plant Extinction Prevention Program. 2011. Plant Extinction Prevention Program annual report, fiscal year 2011 (July 1, 2010-June 30, 2011). 200 pages. Unpublished.

[PEPP] Plant Extinction Prevention Program. 2012. Plant Extinction Prevention Program annual report, fiscal year 2012 (July 1, 2011-June 30, 2012). 169 pages. Unpublished.

- [PEPP] Plant Extinction Prevention Program. 2013. Plant Extinction Prevention Program annual report, fiscal year 2013 (July 1, 2012-June 30, 2013). 207 pages. Unpublished.
- [USFWS] U.S. Fish and Wildlife Service. 1996. Recovery plan for the Molokai plant cluster. U.S. Fish and Wildlife Service, Portland, Oregon. 143 pages.
- [USFWS] U.S. Fish and Wildlife Service. 2008. *Brighamia rockii* 5-year review summary and evaluation. U.S. Fish and Wildlife Service, Honolulu, Hawaii. 11 pages.
- [USFWS] U.S. Fish and Wildlife Service. 2012. Endangered and threatened wildlife and plants; listing 38 species on Molokai, Lanai, and Maui as endangered and designating critical habitat on Molokai, Lanai, Maui, and Kahoolawe for 135 species; proposed rule. Federal Register 77(112):34464-34775.
- Waimea Valley. 2013. Report on controlled propagation of listed and candidate species, as designated under the U.S. Endangered Species Act. Waimea, Hawaii. 16 pages. Unpublished.

U.S. FISH AND WILDLIFE SERVICE
SIGNATURE PAGE for 5-YEAR REVIEW of *Brighamia rockii* (pua'ala)

Pre-1992 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 Programmatic Deputy Field Supervisor, Pacific Islands Fish and Wildlife Office

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Date 2014-03-11