

Brighamia insignis
(Olulu)

**5-Year Review:
Summary and Evaluation**

**U.S. Fish and Wildlife Service
Pacific Islands Fish and Wildlife Office
Honolulu, Hawaii**

5-YEAR REVIEW
***Brighamia insignis* (Olulu)**

I. GENERAL INFORMATION

A. Methodology used to complete the review

This review was conducted by staff of the Pacific Islands Fish and Wildlife Office (PIFWO) of the U.S. Fish and Wildlife Service (USFWS) between June 2006 and June 2007. The National Tropical Botanical Garden provided most of the updated information on the current status of *Brighamia insignis*. They also provided recommendations for conservation actions that may be needed prior to the next five-year review. The evaluation of the lead PIFWO biologist was reviewed by the Plant Recovery Coordinator. These comments were incorporated into the draft five-year review. The document was then reviewed by the Recovery Program Leader and the Assistant Field Supervisor for Endangered Species before final approval.

B. Reviewers

Lead Region --Contact name(s) and phone numbers:

Region 1, Jesse D'Elia, Chief, Division of Recovery, (503) 231-2071

Lead Field Office -- Contact name(s) and phone numbers:

Pacific Islands Fish and Wildlife Office, Gina Shultz, Assistant Field Supervisor for Endangered Species, (808) 792-9400

Cooperating Field Office(s) -- Contact name(s) and phone numbers:

N/A

Cooperating Region(s) -- Contact name(s) and phone numbers:

N/A

C. Background

1. FR Notice citation announcing initiation of this review:

USFWS. 2006. Endangered and threatened wildlife and plants; initiation of 5-year reviews of 70 species in Idaho, Oregon, Washington, Hawaii, and Guam. Federal Register 71(69):18345-18348.

2. Species status

Decreasing (FY 2006 Recovery Data Call)

3. Recovery achieved

1 (0-25%) (FY 2006 Recovery Data Call)

4. Listing history

Original Listing

FR notice: USFWS. 1994. Determination of endangered of threatened status for 24 plants from the island of Kauai, HI; final rule. Federal Register 59(38):9304-9326.

Date listed: February 25, 1994

Entity listed: Species

Classification: Endangered

Revised Listing, if applicable

FR notice: N/A

Date listed: N/A

Entity listed: N/A

Classification: N/A

5. Associated actions:

USFWS. 2003. Endangered and threatened wildlife and plants; final designation of critical habitat for 95 plants species from the islands of Kauai and Niihau, HI; final rule. Federal Register 68(39):9116-9479.

Critical habitat was designated for *Brighamia insignis* in three units totaling 2,043 hectares (5,047 acres) on Kauai and one unit totaling 144 hectares (357 acre) on Niihau. This designation includes habitat on state and private lands (USFWS 2003).

6. Review History

Species status review [FY 2006 Recovery Data Call (September 2006)]:

Decreasing

Recovery achieved:

1 (0-25%) (FY 2006 Recovery Data Call)

7. Species' Recovery Priority Number at start of review

2

8. Recovery Plan or Outline

Name of plan: Recovery plan for the Kaua'i plant cluster. 1995. U.S. Fish and Wildlife Service, Portland, OR. 270 pages.

Date issued: September 20, 1995

Dates of previous revisions: N/A

Indicate if plan is being used: Yes. Some of the actions outlined in the recovery plan have been initiated but not completed (*e.g.*, genetic storage) within the historical range of this species. Some recovery actions will require long-term

commitments (e.g., maintenance of enclosure fences; invasive plant species control, hand pollination) or may only be necessary intermittently (e.g., collect for genetic storage).

II REVIEW ANALYSIS

A. Application of the 1996 Distinct Population Segment (DPS) policy

1. Is the species under review listed as a DPS?

Yes
 No

2. Was the DPS listed prior to 1996?

Yes
 No

a. Prior to this 5-year review, was the DPS classification reviewed to ensure it meets the 1996 policy standards?

Yes
 No

b. Does the original listed entity meet the discreteness and significance elements of the 1996 DPS policy?

Yes
 No

3. Is there relevant new information that would lead you to re-consider the classification of this species with regard to designation of DPSs (i.e., indicates that there was a problem with the original (post-1996) DPS listing, that there is a need for splitting out or combining DPSs, or that there is some other reason to consider a change in listing that involves DPSs)?

Yes
 No

B. Recovery Criteria

1. Does the species have a final, approved recovery plan?

Yes
 No

2. Does the recovery plan contain recovery (i.e., downlisting or delisting) criteria?

Yes
 No

3. Adequacy of recovery criteria.

- a. Do the recovery criteria reflect the best available (i.e., most up-to-date) information on the biology of the species and its habitat?

Yes
 No

- b. Are all of the 5 listing factors that are relevant to the species addressed in the recovery criteria (and there is no new information to consider regarding existing or new threats)?

Yes
 No

- c. If you answered *yes* to both II.B.3.a. and II.B.3.b., go to section II.D. If you answered *no* to either II.B.3.a. or II.B.3.b, go to section II.C.

4. List the recovery criteria as they appear in the recovery plan, and discuss how each criterion has or has not been met, citing information:

A synthesis of the threats (Factors A, B, C, D and E) affecting this species is presented in section 2.4.

Stabilizing, downlisting, and delisting objectives are provided in the recovery plan for Kauai plant cluster (USFWS 1995), based on whether the species is an annual, a short-lived perennial (fewer than ten years), or a long-lived perennial. *Brighamia insignis* is a short-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* (off-site) collection. In addition, a minimum of three populations should be documented on the island of Kauai and one on Niihau where the species now occurs or occurred historically. Each of these populations must be naturally reproducing and increasing in number, with a minimum of 50 mature individuals per population.

This recovery objective has not been met.

For downlisting, a total of five to seven populations of *Brighamia insignis* should be documented on Kauai and at least one on Niihau where it now occurs or occurred historically. Each of these populations must be naturally reproducing, stable or

increasing in number, and secure from threats, with a minimum of 300 mature individuals per population. Each population should persist at this level for a minimum of five consecutive years before downlisting is considered.

This recovery objective has not been met.

For delisting, a total of eight to ten populations of *Brighamia insignis* should be documented on the island of Kauai and at least one on Niihau where it now occurs or occurred historically. Each of these populations must be naturally reproducing, stable or increasing in number, and secure from threats, with 300 mature individuals per population for short-lived perennials. Each population should persist at this level for a minimum of five consecutive years before delisting is considered.

This recovery objective has not been met.

C. Updated Information and Current Species Status

In addition to the status summary table below, information on the species’ status and threats was included in the final critical habitat rule referenced above in section I.C.5 (“Associated Rulemakings”) and in section II.D (“Synthesis”) below, which also includes any new information about the status and threats of the species.

Status of *Brighamia insignis* from listing through 5-year review.

Date	No. wild inds	No. outplanted	Stability Criteria	Stability Criteria Completed?
1994 – listing	Fewer than 40	0	All threats managed in all 3 populations	No
			Complete genetic storage	Unknown
			3 populations with 50 mature individuals each	No
1995 – recovery plan	60-70	20	All threats managed in all 3 populations	No
			Complete genetic storage	Unknown
			3 populations with 50 mature individuals each	No
2003 – critical habitat	42-62	unknown	All threats managed in all 3 populations	No
			Complete genetic storage	Unknown
			3 populations with 50 mature individuals	No

Date	No. wild inds	No. outplanted	Stability Criteria	Stability Criteria Completed?
			each	
2007 – 5-yr review	1	3	All threats managed	No
			Complete genetic storage	Yes
			3 populations with 50 mature individuals each	No

1. Improved Analyses:

Yes
 No

2. Biology and Habitat

- a. Abundance, population trends (*e.g.* increasing, decreasing, stable), demographic features (*e.g.*, age structure, sex ratio, family size, birth rate, age at mortality, mortality rate, etc.), or demographic trends:
- b. Genetics, genetic variation, or trends in genetic variation (*e.g.*, loss of genetic variation, genetic drift, inbreeding, etc.):
- c. Taxonomic classification or changes in nomenclature:
- d. Spatial distribution, trends in spatial distribution (*e.g.* increasingly fragmented, increased numbers of corridors, etc.), or historic range (*e.g.* corrections to the historical range, change in distribution of the species' within its historic range, etc.):
- e. Habitat or ecosystem conditions (*e.g.*, amount, distribution, and suitability of the habitat or ecosystem):
- f. Other:

3. Five Factor Analysis (threats, conservation measures and regulatory mechanisms)

- a. **Present or threatened destruction, modification or curtailment of its habitat or range:**
- b. **Overutilization for commercial, recreational, scientific, or educational purposes:**

- c. **Disease or predation:**
- d. **Inadequacy of existing regulatory mechanisms:**
- e. **Other natural or manmade factors affecting its continued existence:**

D. Synthesis

Brighamia insignis is known historically only from Kauai and Niihau and was listed as endangered in 1994 (USFWS 1994; Hawaii Biodiversity and Mapping Program. 2005; Wagner *et al.* 1999). The historically known populations were distributed on the Na Pali Coast: at Waiahuakua where five plants were seen in 1999 and none remain now, and at Hoolulu where 14 plants were seen in 1999 and only one plant remains (Wood 2002; K. Wood, National Tropical Botanical Garden, pers. comm. 2006). The other two known populations were on the southeastern coast of Kauai near Mt. Haupu, but became extirpated by Hurricane Iniki in 1992 (Perlman 2006; Wood 2005). The species has declined to only one naturally occurring wild individual, and the distribution has declined from four populations on two mountain ranges to only one on the Na Pali Coast. Three additional plants have been outplanted by Hawaii Division of Forestry and Wildlife (National Tropical Botanical Garden 2006a).

Genetic differences between populations of *Brighamia insignis* did not correlate with geographical distance, as the Haupu population was more similar to the Hoolulu population on the Na Pali coast than to the Nawiliwili population. The majority of genetic diversity was found among, rather than within populations, and genetic diversity as a whole for the species was found to be less than for most Hawaiian plant taxa (Gemmill 1996). Gemmill suggested that individuals derived from the now extirpated Waiahuakua population should be used to pollinate other populations to increase their genetic variability, as it is most distinct from the other four known populations (Gemmill *et al.* 1998); this approach has been implemented at National Tropical Botanical Garden in the past (National Tropical Botanical Garden 2006b).

The natural habitat for *Brighamia insignis* includes rocky ledges with little soil or steep sea cliffs in lowland grasslands or shrub lands with annual rainfall of less than 65 inches (170 centimeters) (USFWS 1995 and 2003). Vegetation on the Na Pali Coast and Mt. Haupu has been highly degraded since the hurricanes of 1982 and 1992 and goats have eliminated much of the native vegetation and destroyed individual plants of *B. insignis* (Perlman 2006).

Feral pigs degrade the habitat of *Brighamia insignis* (Factors A and D) (Perlman 2006). Numerous invasive plants species degrade habitat of and compete with *B. insignis* seedling establishment (Factor E) (Perlman 2006; USFWS 1995). Other threats that affect *B. insignis* include: slugs and rats that eat seeds and leaves, carmine spider mites, and feral goats that are known to defoliate *B. insignis* (Factor C)

(USFWS 1994; Perlman 2006). An unidentified fungal disease affected a number of cultivated *B. insignis*, causing a softening and collapse of the main stem tissue from the base (Factor C) (S. Perlman, National Tropical Botanical Garden, pers. comm. 2006). *Brighamia insignis* has been heavily impacted by hurricanes, as it grows on exposed cliffs. It is vulnerable to landslides, which become more frequent with increased goat populations (Factor E) (Perlman 2006; Wood 2002). Pollination has been a problem for this species; it is presumed that the natural pollinator is a Sphingidae moth that now is either extinct or in extremely low numbers, which directly affects the amount of seed production for this species (Factor E) (Perlman 2006; K. Wood, pers. comm. 2006). Some of the extirpated populations on the Na Pali Coast occurred near trails, which exposed the plants to overcollection and an increased likelihood of rock slides and invasive species introductions caused by hikers (Factor B) (USFWS 1995). Species like *B. insignis* that are very low in number and endemic to small portions of an island are inherently more vulnerable to extinction than widespread species because of the higher risks posed by genetic bottlenecks, random demographic fluctuations and localized catastrophes such as hurricanes (Factor E).

Some cultivated plants had been observed to produce seeds and pollen, but in the last few decades hand pollination has been more successful (R. Nishek, National Tropical Botanical Garden, pers. comm. 2006). The identity of individual populations in cultivation has been only partially maintained. The Lyon Arboretum Micropropagation Laboratory also has seedlings grown from seeds collected from the Hoolulu Valley and Mt. Haupu populations. These plants will be used for genetic storage and for outplanting by the Hawaii Division of Forestry and Wildlife (Harold L. Lyon Arboretum Micropropagation Laboratory 2006). The plant grows well in a nursery setting, but is difficult to maintain upon outplanting; plantings must be replaced after several years (L. Pigott Burney, National Tropical Botanical Garden, pers. comm. 2006). Outplanting has been done in National Tropical Botanical Garden Nursery and living collection, Limahuli Garden, Kilauea lighthouse, Hawaii Botanical Gardens, and Maupulehu Cave Reserve (Perlman 2006; L. Pigott Burney, pers. comm. 2006) for genetic storage and future restoration. Three plants were outplanted by the Hawaii Division of Forestry and Wildlife (National Tropical Botanical Garden 2006a).

Brighamia insignis is well represented in propagation, but no management has occurred within the species' natural habitat and only one originally wild and three outplanted individuals are extant outside of cultivation. The stabilization and recovery goals for this species have not been met, and therefore *Brighamia insignis* meets the definition of endangered as it remains in danger of extinction throughout its range.

III. RESULTS

A. Recommended Classification:

Yes, downlist to Threatened

- Yes, uplist to Endangered
 Yes, delist
 No, no change is needed

B. New Recovery Priority Number N/A

C. If applicable, indicate the Listing and Reclassification Priority Number (FWS only): N/A

Reclassification (from Threatened to Endangered) Priority Number: _____

Reclassification (from Endangered to Threatened) Priority Number: _____

Delisting (Removal from list regardless of current classification) Priority Number: _____

IV. RECOMMENDATIONS FOR FUTURE ACTIONS:

- Determine management needs of the immediate area of the one remaining naturally occurring wild individual and implement them to prevent complete extinction in the wild.
- Increase the number of individuals in cultivation and genetic storage through controlled breeding.
- Reintroduce populations in areas of suitable habitat that can be protected from goats and other ungulates, rats, and human disturbance.
- Review the complete living collections to determine where progeny derived from crosses with the Waiahuakua Valley population still exist, as these plants would provide the best source to increase the genetic diversity within the species, based on the existing genetics work.
- Conduct a more detailed genetic study of the individuals in the wild and in cultivation to determine micro-level distinctions between populations and individuals, to assist in determining suitable material to use of hand pollinated crosses.

V. REFERENCES:

Gemmill, C.E.C. 1996. Population genetics and systematics of the Hawaiian taxa *Pritchardia* (Arecaceae) and *Brighamia* (Campanulaceae). Masters thesis for University of Colorado, Department of Environmental Population and Organism Biology, Boulder, Colorado. Unpublished.

Gemmill, C.E.C., T.A. Ranker, D. Ragone, S.P. Perlman, and K.R. Wood. 1998. Conservation genetics of the endangered endemic Hawaiian genus *Brighamia* (Campanulaceae). *American Journal of Botany* 85(4):528-539.

Harold L. Lyon Arboretum Micropropagation Laboratory. 2006. Report on controlled propagation of species, as designated under the U.S. Endangered Species Act. Unpublished.

Hawaii Biodiversity and Mapping Program. 2005. Program Database. Unpublished

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National Tropical Botanical Garden. 2006b. Database query for *Brighamia insignis* localities. September 29, 2006. Unpublished.

Perlman, S. 2006. Field notes, summary for *Brighamia insignis*. National Tropical Botanical Garden, Lawai, Hawaii. Unpublished.

[USFWS] U.S. Fish and Wildlife Service. 2003. Endangered and threatened wildlife and plants; Final designation of critical habitat for 95 plant species from the islands of Kauai and Niihau, HI; final rule. *Federal Register* 68 (39):9116-9479.

[USFWS] U.S. Fish and Wildlife Service. 1995. Recovery plan for the Kaua'i plant cluster. U.S. Fish and Wildlife Service, Portland, OR. 270 pages.

[USFWS] U.S. Fish and Wildlife Service. 1994. Endangered and threatened wildlife and plants; Determination of endangered or threatened status for 24 plants from the island of Kauai, HI; Final rule. *Federal Register* 59(38):9303-9329.

Wagner, W.L., D. Herbst, and S.H. Sohmer. 1999. Manual of the flowering plants of Hawai'i, Revised Edition. University of Hawai'i Press, Bishop Museum Press, Special Publication. 97:1-1918.

Wood, K. R. 2002. The distribution and abundance of *Brighamia rockii* & *Brighamia insignis* (Campanulaceae) with an ecological description of *B. rockii* on the cliffs of Haupu Bay, Moloka'i, Hawai'i. Special report prepared for The Nature Conservancy of Hawai'i. Technical Report, 20 pages. Unpublished.

Personal and Written Communications:

Robert Nishek, Nursery Manager, National Tropical Botanical Garden, September 2006.

Steve Perlman, Field Botanist, National Tropical Botanical Garden, October 4, 2006.

Lida Pigott Burney, Manager, Makauwahi Cave Reserve, National Botanical Tropical Garden
December 28, 2006.

Ken R. Wood, Research Biologist, National Tropical Botanical Garden, September 23, 2006.

U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW of *Brighamia insignis* (Olulu)

Current Classification E

Recommendation resulting from the 5-Year Review

- Downlist to Threatened**
- Uplist to Endangered**
- Delist**
- No change is needed**

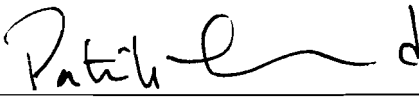
Appropriate Listing/Reclassification Priority Number _____

Review Conducted By

Marilet A. Zablan, Recovery Program Leader and Acting Assistant Field Supervisor for Endangered Species, June 27, 2007

Marie Bruegmann, Plant Recovery Coordinator, December 7, 2006, May 24 and June 28, 2007

Christian Torres-Santana, Fish and Wildlife Biologist, December 1, 2006, February 2 and June 27, 2007

Approve  Date 1/18/08
Lead Field Supervisor, Fish and Wildlife Service