

5-YEAR REVIEW

Short Form Summary

Species Reviewed: *Hibiscus brackenridgei* (ma`o hau hele [= native yellow hibiscus])

Current Classification: Endangered

Federal Register Notice announcing initiation of this review:

[USFWS] U.S. Fish and Wildlife Service. 2010. Endangered and threatened wildlife and plants; initiation of 5-year status reviews of 58 species in Washington, Oregon, California, and Hawaii. Federal Register 75(226):71726-71729.

Lead Region/Field Office:

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

Name of Reviewer(s):

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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 January 31, 2012. The review was based on a review of current, available information since the last five-year review for *Hibiscus brackenridgei* (USFWS 2009). The National Tropical Botanical Garden provided an initial draft of portions of the five-year review and recommendations for conservation actions needed prior to the next five-year review. The document was reviewed by the Plant Biologist, Islands 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 *Hibiscus brackenridgei* published on July 21, 2009 (available at http://ecos.fws.gov/docs/five_year_review/doc2474.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 *H. brackenridgei*.

This short-lived shrub is endangered and occurs on Lanai, Hawaii, Oahu, and Maui and historically on Hawaii Island. The current status and trends for *Hibiscus brackenridgei* are provided in the tables below.

New status information:

- *Hibiscus brackenridgei* subsp. *brackenridgei* is the subspecies on the islands of Lanai, Maui, and Hawaii.
 - On the island of Lanai there are only two or three individuals in the Keomuku Road area (H. Oppenheimer, Plant Extinction Prevention Program [PEPP], pers. comm. 2012b).
 - When last monitored there was one individual that was not producing seed, located in the Lanai Cooperative Game Management Area enclosure (H. Oppenheimer, pers. comm. 2012b).
 - A population on East Maui on private land contains two individuals as of May 2011; one was fenced by PEPP staff and the landowner (H. Oppenheimer, pers. comm. 2012a).
 - There has been no sign of the Lihau Natural Area Reserve population of West Maui, although not all of the population was within the Natural Area Reserve fence. Some individuals were thought to be located down slope, on either state and/or private land (H. Oppenheimer, pers. comm. 2012a).
 - A population on West Maui on private lands in the Waikapu still exists. At the last site visit in January 2012 the area was still under drought conditions, but there were eight mature and 18 immature individuals, and 33 seedlings. Three additional individuals in this area were found by the landowner. One died in a fire and the other two probably are still extant (H. Oppenheimer, pers. comm. 2012a).
- On the island of Hawaii, two wild populations of *Hibiscus brackenridgei* subsp. *brackenridgei* remain.
 - Nine wild individuals grow inside a 0.4 hectare (one-acre) ungulate enclosure fence at Puu Waawaa Forest Reserve on the Puu Anahulu bluff, last monitored in March 2012. While the enclosure is small, considering the steepness of the terrain, ongoing erosion, and highly altered habitat, it is effective in that there is natural recruitment of the species around these plants in the enclosure (N. Agorastos, Hawaii State Department of Land and Natural Resources, Division of Forestry and Wildlife [DLNR-DOFAW], pers. comm. 2012; E. Parsons, DLNR-DOFAW, pers. comm. 2012; P. Moriyasu, VRPF, pers. comm. 2012).
 - The second population, referred to as the Lalamilo population, located just outside of Waimea, is now extirpated. DLNR-DOFAW has progeny of the Lalamilo stock in local restoration sites and at the Volcano Rare Plant Facility (VRPF) (N. Agorastos, pers. comm. 2012; E. Parsons, pers. comm. 2012; P. Moriyasu, VRPF, pers. comm. 2012).
- The Oahu Army Natural Resource Program (OANRP) manages 48 mature and 27 immature individuals of *Hibiscus brackenridgei* subsp. *mokuleianus* in Makua. Of the mature individuals, 41 were reintroduced as an augmentation of the existing population. In five additional locations, there are estimated 36 mature

and 188 immature individuals, and five seedlings of *Hibiscus brackenridgei* subsp. *mokuleianus* in Kaumoku Nui, Keaau, Haili-Kawaiu, Kihakapu-Puulu, and Kaimuhole-Palikea gulches on State and private lands. Only Kaumoku Nui and Haili-Kawaiu were monitored in 2012, with only small changes noted (OANRP 2012a). Contrary to previous reports, OANRP classifies all Oahu occurrences as *Hibiscus brackenridgei* subsp. *mokuleianus*, including the Makua population which has previously been referred to as *Hibiscus brackenridgei* subsp. *molokaiana* (M. Keir, OANRP, pers. comm. 2012).

Overall, the species *Hibiscus brackenridgei* has increased from the 245 reported in the last five-year review to 680 individuals, representing the different subspecies as follows: *H. brackenridgei* subsp. *brackenridgei* 376 individuals (24 mature, 52 immature and 300 reintroductions) and *H. brackenridgei* subsp. *mokuleianus* 304 individuals (43 mature, 220 immature and 41 reintroductions).

New threats:

- Climate change - Climate change may pose a threat to this species. However, current climate change analyses in the Pacific Islands lack sufficient spatial resolution to make predictions on impacts to this species. The Pacific Islands Climate Change Cooperative (PICCC) funded climate modeling that will help resolve these spatial limitations. High spatial resolution climate outputs are expected to be available sometime in 2013.
- Hybridization - An additional threat to these small wild populations is genetic pollution by cross pollination with *Hibiscus brackenridgei* of unknown stock or origin which has been outplanted near these wild plants. It is possible to purchase *Hibiscus brackenridgei* at local nurseries of unknown parentage. DOFAW has written to express their concern to collaborators and neighboring land managers who want to landscape or restore former dry forest communities, but planting has occurred despite these written communications. So far these outplantings appear to have failed, but the concern remains for the long term integrity of this species on the island of Oahu (N. Agorastos, pers. comm. 2012; E. Parsons, pers. comm. 2012).

New management actions:

- Captive propagation for genetic storage and reintroduction
 - OANRP has 454 individuals of *Hibiscus brackenridgei* subsp. *mokuleianus* their nursery (OANRP 2012b).
 - In February 2011, 24 cuttings from the wild *Hibiscus brackenridgei* subsp. *mokuleianus* were planted on the Waiialua High School Campus to serve as a genetic storage for the species (Welch 2011).
 - In 2011, VRPF on Hawaii Island had 22 PuuWaawaa plants and 18 Kohala plants in greenhouse stock (VRPF 2011).
 - Volcano Rare Plant Facility inventory included 20 of the Koiaie population of *Hibiscus brackenridgei* subsp. *brackenridgei* (VRPF 2010).
 - PEPP staff collected seeds of *Hibiscus brackenridgei* subsp. *brackenridgei* from the Waikapu population on West Maui in 2011 (H. Oppenheimer, pers. comm. 2012a).

- Seeds from the Kanepuu outplants were collected in 2012 by PEPP staff (H. Oppenheimer, pers. comm. 2012b).
- The most comprehensive *ex situ* collections of all three subspecies are at Waimea Valley on Oahu (Waimea Valley 2011).
- Reintroduction/translocation implementation:
 - From 2006-2008, 137 individuals of *Hibiscus brackenridgei* subsp. *brackenridgei* were reintroduced in Kohala (VRPF 2006, 2007, 2008; P. Moriyasu, pers. comm. 2012).
 - Forty-two individuals of *Hibiscus brackenridgei* subsp. *brackenridgei* were reintroduced in Puu Waawaa from 2006 to 2008 (VRPF 2006, 2007, 2008; P. Moriyasu, pers. comm. 2012).
 - Two individuals of *Hibiscus brackenridgei* subsp. *brackenridgei* were reintroduced at Puu Anahulu in 2007 (VRPF 2007; P. Moriyasu, pers. comm. 2012).
 - Fifty-six Kohala and Puu Waawaa individuals of *Hibiscus brackenridgei* subsp. *brackenridgei* were reintroduced in 2010 and 2011 (VRPF 2010, 2011; P. Moriyasu, pers. comm. 2012).
 - Material from *Hibiscus brackenridgei* subsp. *brackenridgei* from the now extirpated Puu O Kali population was grown at the Maui Nui Botanical Garden and outplanted in a fence at Puu O Kali. However, serious drought year 2011 killed all the individuals which had been outplanted there (A. Medeiros, U.S. Geological Survey, pers. comm. 2012).
 - The Plant Extinction Prevention Program staff reintroduced cuttings from the single plant Lanai plant of *Hibiscus brackenridgei* subsp. *brackenridgei* in the Lanai Cooperative Game Management Area enclosure. Of those, 9 individuals remain (H. Oppenheimer, pers. comm. 2012).
 - The Oahu Army Natural Resource Program (OANRP) has augmented 41 mature individuals of *Hibiscus brackenridgei* subsp. *mokuleianus* to the Makua population (M. Keir, pers. comm. 2012).
 - Individuals in Kanepuu on Lanai are suspected to have been planted in the late 1980s or early 1990s. These individuals are of an unknown lineage but suspected to be from a historical Lanai population at Kaena Point having a shrubby, erect form. The plants along Keomuku Road and on Lanai Cooperative Game Management Area are low to the ground with leaves mostly glabrous, almost succulent. The Kanepuu plants are naturally reproducing and last year Plant Extinction Prevention Program staff found two seedlings about 100 meters (328 feet) from the plantings. At the original reintroduction site there were three mature and four immature individuals, and 24 seedlings in December 2011. The fact that the two different forms are in proximity at Kanepuu is a cause for concern with respect to genetics. Seed was collected and sent to Lyon Arboretum for storage in case they do represent an extinct population (H. Oppenheimer, pers. comm. 2012).

- Ungulate exclosures
 - Plans for a proposed fence for the Keaau area, when complete, will provide protection for *Hibiscus brackenridgei* subsp. *mokuleianus* from pigs, goats, and cattle (U. S. Army Garrison 2011).
 - One plant of *Hibiscus brackenridgei* subsp. *brackenridgei* on East Maui was fenced by Plant Extinction Prevention Program staff and the landowner (H. Oppenheimer, pers. comm. 2012).
- Fire protection - *Urochloa maxima* (Guinea grass) control is occurring in fallow agricultural fields along Kaukonahua Road on Oahu to control fuel for protection of *Hibiscus brackenridgei* subsp. *mokuleianus* from wildfires. Several times a year the grass is plowed under to maintain a firebreak between the road and the forest (Welch 2011).
- Population viability monitoring
 - A population of *Hibiscus brackenridgei* subsp. *brackenridgei* on West Maui was last visited in January 2012. The area was under drought conditions, but eight mature, 18 immature, and 33 seedling individuals were located (H. Oppenheimer, pers. comm. 2012a).
 - Populations of *Hibiscus brackenridgei* subsp. *mokuleianus* at Kaumoku Nui and Haili-Kawaiu were monitored in 2012, with only small changes in numbers (OANRP 2012a).
 - *H. brackenridgei* subsp. *brackenridgei* individuals inside a one-acre ungulate exclosure fence at Puu Waawaa Forest Reserve on the Puu Anahulu bluff were last monitored in March 2012 (N. Agorastos, pers. comm. 2012; E. Parsons, pers. comm. 2012).

Synthesis:

Stabilizing, downlisting, and delisting objectives are provided in the recovery plan for the multi-island plants (USFWS 1999), based on whether the species is an annual, a short-lived perennial (fewer than 10 years), or a long-lived perennial. *Hibiscus brackenridgei* is a short-lived perennial, and to be considered stabilized, which is the first step in recovering the species, the taxon must be managed to control threats (*e.g.*, fenced, weeding, etc.) and be represented in an *ex situ* (off-site) collection. In addition, a minimum of three populations should be documented on islands where they now occur or occurred historically. Each of these populations must be naturally reproducing and increasing in number, with a minimum of 50 mature individuals per population.

These stabilization objectives have not been met as none of the populations contain more than 50 mature individuals (Table 1), and not all threats are being sufficiently managed, especially fire, which is one of the major threats to the species (see Table 2). Therefore, *Hibiscus brackenridgei* meets the definition of endangered as it remains in danger of extinction throughout its range.

Recommendations for Future Actions:

- Captive propagation for genetic storage and reintroduction - Continue collection of fruit and plant material for future reintroductions.

- Ungulate exclosures - Construct exclosure fences to protect individuals from the negative impacts of feral ungulates
- Ecosystem-altering invasive plant species control - Eradicate invasive introduced plant species within the ungulate exclosures.
- Fire protection - Develop and implement fire management plans for all wild and reintroduced populations.
- Reintroduction / translocation
 - Establish new populations within protected habitats.
 - Augment current natural populations.
- Surveys / inventories - Survey geographical and historical range for a thorough current assessment of the species.
- Alliance and partnership development - Initiate planning and contribute to implementation of ecosystem-level management and restoration to benefit this species.
- Population biology research
 - Assess genetic variability within extant populations.
 - Study *Hibiscus brackenridgei* populations with regard to population size and structure, geographical distribution, flowering cycles, pollination vectors, seed dispersal agents, longevity, specific environmental requirements, limiting factors, and threats.

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

Date	No. wild individuals	No. outplanted	Stabilization Criteria identified in Recovery Plan	Stabilization Criteria Completed?
1994 (listing)	~60	25	All threats managed in all 3 populations	Partially
			Complete genetic storage	No
			3 populations with 50 mature individuals each	No
1999 (recovery plan)	311-364	2	All threats managed in all 3 populations	Partially
			Complete genetic storage	Partially
			3 populations with 300 mature individuals each	Partially
2003 (critical)	> 271	Unknown	All threats	Partially

Date	No. wild individuals	No. outplanted	Stabilization Criteria identified in Recovery Plan	Stabilization Criteria Completed?
habitat)			managed in all 3 populations	
			Complete genetic storage	Partially
			3 populations with 300 mature individuals each	Partially
2009 (5-yr review)	~245	315	All threats managed in all 3 populations	Partially
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	Partially
2013 (5-yr review)	<i>H. brackenridgei</i> subsp. <i>mokuleianus</i> 260; <i>H. brackenridgei</i> subsp. <i>brackenridgei</i> 76	<i>H. brackenridgei</i> subsp. <i>mokuleianus</i> 41; <i>H. brackenridgei</i> subsp. <i>brackenridgei</i> approx. 300	All threats managed in all 3 populations	Partially (Table 2)
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	No

Table 2. Status of threats to *Hibiscus brackenridgei* and ongoing conservation efforts.

Threat	Listing factor	Current Status	Conservation/ Management Efforts
Ungulates –(deer, sheep, cattle, pigs) habitat modification and herbivory	A, C, D, E	Ongoing	Partially:
Fire – habitat modification and plant destruction	A, E	Ongoing	None
Invasive introduced plants	E	Ongoing	Partially

Road construction	E		Oahu
Predation by insects Chinese rose beetle (<i>Adoretus sinicus</i>)	C	Ongoing	None
Predation by rats	A, C	Ongoing	None
Climate change	A, E	Increasing	None
Hybridization	E	Ongoing	None

References:

See previous 5-year review for a full list of references (USFWS 2009). Only references for new information are provided below.

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U.S. FISH AND WILDLIFE SERVICE

SIGNATURE PAGE for 5-YEAR REVIEW of *Hibiscus brackenridgei* (ma'o hau hele or native yellow hibiscus)

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

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