5-YEAR REVIEW

Short Form Summary

Species Reviewed: *Hibiscus clayi* (Clay's hibiscus)

Current Classification: Endangered

Federal Register Notice announcing initiation of this review:

[USFWS] U.S. Fish and Wildlife Service. 2015. Endangered and threatened wildlife and plants; initiation of 5-year status reviews of 133 species in Hawaii, Oregon, Idaho, and Washington. Federal Register 80(30): 8100–8103.

Lead Region/Field Office:

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

Name of Reviewer(s):

Cheryl Phillipson, Biologist, PIFWO
Lauren Weisenberger, Plant Recovery Coordinator, PIFWO
Gregory Koob, 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 (USFWS) beginning in January 2016. The review was based on a review of current, available information since the last 5-year review for *Hibiscus clayi* (USFWS 2008). The evaluation by Cheryl Phillipson, Biologist, was reviewed by Lauren Weisenberger, Plant Recovery Coordinator, and Gregory Koob, 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 (*http://ecos.fws.gov/tess_public*).

Review Analysis:

Please refer to the previous 5-year review for *Hibiscus clayi* published in the Federal Register on January 18, 2008 (USFWS 2008, available at *https://ecos.fws.gov/docs/five_year_review/doc1842.pdf*) for a complete review of the species' status, threats, and management efforts. No significant new information regarding the species biological status have come to light since listing to warrant a change in the Federal listing status of *H. clayi*.

This long-lived perennial shrub or tree in the Malvaceae family is endangered and endemic to the island of Kauai. The current status and trends for *Hibiscus clayi* 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:

- In 2011, new populations of *Hibiscus clayi* were found in Moloaa Forest Reserve (FR) (McDowell 2011, in litt.; NTBG 2011a; PEPP 2012). Twenty-eight individuals were counted, but the population size is estimated to be greater than 50.

New Threats:

- Ungulate degradation of habitat—In addition to habitat degradation by feral pigs, habitat degradation leading to increased erosion and landslides by feral goats is also a threat to *Hibiscus clayi* at the Moloaa FR occurrences (NTBG 2011b-d).
- Climate change loss or degradation of habitat—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. This assessment concluded that *Hibiscus clayi* is extremely vulnerable to the impacts of climate change with a vulnerability score of 0.91 (on a scale of 0 being not vulnerable to 1 being extremely vulnerable to climate change). Therefore, additional management actions are needed to conserve this taxon into the future.
- Fire destruction or degradation of habitat—Fire is noted as a threat to the Moloaa FR occurrences of *Hibiscus clayi* (NTBG 2011b-d). Invasive introduced plant species modify habitats occupied by native plant species by changing the availability of light, altering soil-water regimes, modifying nutrient cycling, and changing the fire characteristics of the native plant community. Fire can destroy dormant seeds as well as individual plants. Successive fires burn farther and farther into native habitat and alter microclimate conditions to further alter habitat conditions to favor nonnative plants. Nonnative plants convert native plant communities to nonnative dominated plant communities (D'Antonio and Vitousek 1992; Tunison *et al*. 2002). Increasing episodes of drought, expansion of invasive grass cover, and temperature increases have led to an increase in the number of wildfires on Kauai (Trauernicht *et al.* 2015).
- Human disturbance—Trail maintenance—An individual of *Hibiscus clayi* at Nounou was found damaged by trail maintenance efforts (PEPP 2013).

New Management Actions:

- Ungulate monitoring and control—A few individuals of *Hibiscus clayi* within a fenced exclosure are provided protection from feral ungulates (PEPP 2010). However, the fence was recently damaged in a landslide, and it is unknown when repairs may occur (PEPP 2013).
- Captive propagation for genetic storage and reintroduction—Cuttings and seeds are being collected for storage and propagation (NTBG 2017; Lyon Arboretum 2017). Individuals from 22 different collection events are planted in protected garden settings (NTBG 2017). Seeds from two different individuals found in two different populations are represented in the NTBG seed bank. Lyon Arboretum seed bank has two founders from one population in storage (Lyon Arboretum 2017). In addition, this species is widely available in commercial cultivation because of its charismatic red flower.

- Stochastic events—Build resilience and redundancy—Outplanting of individuals of *Hibiscus clayi* at Moloaa and Nounou are ongoing. At least 50 individuals have been outplanted in three separate locations (PEPP 2010, 2011, 2012, 2013, 2014).

Synthesis:
Surveys conducted since completion of the last 5-year review for this species located new populations of *Hibiscus clayi* in Moloaa FR (PEPP 2012, 2013, 2014, 2015, 2016). Currently, there are four known populations totaling 80 to 93 individuals. Because of this, PEPP downgraded the species' conservation status from "PEP" to "POP," meaning that there are now more than 50 individuals in the wild (PEPP 2012). A landscape-based assessment of climate change vulnerability for native plants of Hawaii using high resolution climate change projections was made by Fortini *et al.* (2013) and their analysis showed that *H. clayi* is highly vulnerable to the effects of climate change. Habitat degradation by feral goats, leading to erosion and landslides, is an additional threat to the species at Moloaa FR. Fire, due to continued years of drought on Kauai, is a potential threat, as it can occur at any time and destroy habitat and the remaining populations of *H. clayi*. Outplanting efforts are ongoing, with more than 50 individuals reintroduced.

Stabilizing (interim), downlisting, and delisting objectives were provided in the Recovery Plan for the Kauai Plant Cluster (USFWS 1995), and have been updated according to the draft revised recovery objective guidelines developed by the Hawaii 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 determination 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.

Hibiscus clayi is a long-lived perennial shrub or tree with a narrow range. To prevent extinction, which is the first step in recovering the species, the taxon must be managed to control threats (*e.g.*, fenced) and have 50 individuals from each of three populations represented in an *ex situ* (at other than the plant's natural location, such as a nursery or seed bank) collection. In addition, a minimum of three populations should be documented on Kauai where they now occur or occurred historically and each of these populations must be naturally reproducing (*i.e*. viable seeds, seedlings), with a minimum of 25 mature individuals per population.

The preventing extinction goals for this species have not been met, as only one population has more than 25 individuals, genetic representation is incomplete (Table 1), and all threats are not being sufficiently managed throughout the range of the species (Table 2). Therefore, *Hibiscus clayi* meets the definition of endangered as it remains in danger of extinction throughout its range.

Recommendations for Future Actions:
The following recommendations for future actions are reflective of new threats and reiterated for 5-year review for 2017.

- Surveys and inventories—Continue to survey for populations in known historical range and suitable habitat.
- Ungulate monitoring and control—Continue to construct and maintain fenced exclosures to protect individuals from the negative impacts of feral ungulates. Protect all occurrences against browsing and disturbances from feral ungulates to prevent imminent extinction.
- Invasive plant monitoring and control—
    - Control established ecosystem-altering nonnative invasive plant species around all populations.
    - Control invasive nonnative species that compete with the species around all populations.
- Captive propagation for genetic storage and reintroduction—Continue to collect seeds and cuttings for storage and propagation.
- Reintroduction and translocation—Continue to reintroduce individuals into suitable habitat within historic range that is being managed for known threats to this species.
- Predator and herbivore control research—
    - Control rats at all populations.
    - Investigate control methods for Hibiscus mites and determine the need for additional recovery actions.
- Human interaction monitoring and management—Develop and implement measures to reduce the threat of collecting. Inform trail maintenance personal regarding the locations of rare and endangered species.
- Stochastic events—Build resilience and redundancy—Increase numbers of populations and individuals scattered through historic range to reduce impacts from landslides and storms.
- Population biology research—Summarize available biological information to determine information gained regarding flowering cycles, pollination vectors, seed dispersal agents, longevity, specific environmental requirements, or limiting factors of *Hibiscus clayi*.

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

Date	No. wild individuals	No. outplanted	Stability Criteria identified in Recovery Plan	Stability Criteria Completed?
1994 (listing)	4	0	All threats managed in all three populations	No
			Complete genetic storage	No
			Three populations with 25 mature individuals each	No

1995 (recovery plan)	4	11	All threats managed in all three populations	No
			Complete genetic storage	No
			Three populations with 25 mature individuals each	No
2003 (critical habitat)	4	11	All threats managed in all three populations	No
			Complete genetic storage	No
			Three populations with 25 mature individuals each	No
2008 (5-year review)	5	15	All threats managed in all three populations	No
			Complete genetic storage	No
			Three populations with 25 mature individuals each	No
Date	**No. wild individuals**	**No. outplanted**	***Preventing Extinction Criteria identified by HPPRCC**	***Preventing Extinction Criteria Completed?**
2016 (5-year Review)	93	ca 50	All threats managed in all three populations	No
			Complete genetic storage	No
			Reproduction (*i.e.* viable seeds, seedlings) at all three populations	Unknown

			Three populations with 25 mature individuals each	Partially

*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 after Preventing Extinction).

Table 2. Threats to *Hibiscus clayi* and conservation efforts.

Threat	Listing factor	Current Status	Conservation/ Management Efforts
Ungulate degradation of habitat	A	Ongoing	Partial, one occurrence fenced
Established ecosystem altering invasive plant species degradation of habitat	A	Ongoing	None
Landslides and flooding destruction or degradation of habitat	A	Ongoing	None
Fire destruction or degradation of habitat	A	Ongoing	None
Hurricane destruction and degradation of habitat	A	Ongoing	None
Climate change loss or degradation of habitat	A	Ongoing	None
Predation or herbivory by rats	C	Ongoing	None
Invertebrate predation or herbivory	C	Ongoing	None
Human disturbance	E	Ongoing	None
Stochastic events—Reduced viability due to low numbers	E	Ongoing	Partial, propagation and outplanting efforts

References:

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

D'Antonio, C.M. and P.M. Vitousek. 1992. Biological invasions by exotic grasses, the grass/fire cycle and global change. Annual Review of Ecology and Systematics 23: 63–88.

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. 134 pp.

[HPPRCC] Hawaii and Pacific Plants Recovery Coordinating Committee. 2011. Revised recovery objective guidelines. 12 pp.

Lyon Arboretum. 2017. Micropropagation and Seed Conservation Laboratories controlled propagation database.

McDowell, W. 2011, in litt. Email regarding current status of *Hibiscus clayi* at Moloaa FR. 20 JUL 2011.

[NTBG] National Tropical Botanical Garden. 2011a. NTBG database herbarium specimen detail for *Hibiscadelphus clayi* 059317, 17 JUL 2011.

[NTBG] 2011b. NTBG database herbarium specimen detail for *Hibiscadelphus clayi.* 060957, 11 MAY 2010.

[NTBG]. 2011c. NTBG database herbarium specimen detail for *Hibiscadelphus clayi.* 061037, 17 JUL 2011.

[NTBG] 2011d. NTBG database herbarium specimen detail for *Hibiscadelphus clayi.* 061007, 17 JUL 2011.

[NTBG] 2017. NTBG controlled propagation report.

[PEPP] Plant Extinction Prevention Program. 2010. Annual report fiscal year 2010 (July 1, 2009-June 30, 2010). 121 pp.

[PEPP] 2011. Annual report fiscal year 2011 (July 1, 2010-June 30, 2011). 200 pp.

[PEPP] 2012. Annual report fiscal year 2012 (July 1, 2011-June 30, 2012). 169 pp.

[PEPP] 2013. Annual report fiscal year 2013 (July 1, 2012-June 30, 2013). 207 pp.

[PEPP] 2014. Annual report fiscal year 2014 (July 1, 2013-June 30, 2014). 185 pp.

Trauernicht, C., E. Pickett, C.P. Giardina, C.M. Litton, S. Cordell, and A. Beavers. 2015. The contemporary scale and context of wildfire in Hawaii. Pacific Science 69: 427–444.

Tunison, J.T., C.M. D'Antonio, and R.K. Loh. 2002. Fire and invasive plants in Hawaii Volcanoes National Park. Proceedings of the Invasive Species Workshop: the Role of Fire in the Control and Spread of Invasive Species, *In* Fire Conference 2000: the First National Congress on Fire Ecology, Prevention, and Management, Tall Timbers Research Station, Tallhassee, FL. Pp. 122–130.

[USFWS] U. S. Fish and Wildlife Service. 2008. *Hibiscus clayi* 5-year review summary and evaluation. *https://ecos.fws.gov/docs/five_year_review/doc1842.pdf.*

[USFWS] 2015. Endangered and threatened wildlife and plants; initiation of 5-year status reviews of 133 species in Hawaii, Oregon, Idaho, and Washington. 80 FR 8100, February 13, 2015.

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SIGNATURE PAGE for 5-YEAR REVIEW of *Hibiscus clayi*
(Clay's 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
__X__ No Change in listing status

For **Field Supervisor, Pacific Islands Fish and Wildlife Office**

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