5-YEAR REVIEW

Short Form Summary

Species Reviewed: *Abutilon menziesii* (koʻoloaʻula)

Current Classification: Endangered

Federal Register Notice announcing initiation of this review:

[USFWS] U.S. Fish and Wildlife Service. 2018. Endangered and threatened wildlife and plants; initiation of 5-year status reviews for 18 species in Hawaii, Oregon, Washington, Idaho, and Canada. Federal Register 83(14): 3014–3015.

Lead Region/Field Office:

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

Name of Reviewers:

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 (Service) beginning in January 2018. The review was based on a review of current, available information since the last 5-year review for *Abutilon menziesii* (USFWS 2011). 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 *Abutilon menziesii* published in the Federal Register on August 2, 2011 (available at *https://ecos.fws.gov/docs/five_year_review/doc3798.pdf*) for a complete review of the species' status, threats, and management efforts. 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 *A. menziesii*.

This long-lived perennial shrub in the Malvaceae (mallow) family is endangered and known from the islands of Hawaiʻi, Maui, Lānaʻi, and Oʻahu. The current status and trends for *Abutilon menziesii* are provided in the tables below.

New Status Information:

- The National Tropical Botanical Garden (NTBG) reported six individuals on Lānaʻi at Naupaka and about 50 individuals at Keone (NTBG 2013a, 2013b). The Plant Extinction Prevention program (PEPP) reported about 50 individuals on Lānaʻi at Paliamano Gulch in 2013, 46 individuals at Puu Māhanalua in 2017, and 40 individuals at Mānele in 2018 (PEPP 2013; PEPP 2017a, 2018). On Maui, there are currently 200 individuals within a fenced exclosure at Puʻu o Kali (PEPP 2011) with an unknown number of individuals outside the fence; at least eight wild individuals at Kalialinui Gulch (Lyon Arboretum 2017; PEPP 2017a). On Oahu, a Habitat Conservation Plan for this species established a Contingency Reserve Area with wild plants (CRA) and three mitigation sites (DOFAW 2016). Twenty wild individuals are at Kapolei (DOFAW 2017). Three (possibly as many as nine) wild individuals were last observed at Lualualei in 2011 (Service 2011; Williams 2011, in litt.). Currently, there are no known wild individuals on Hawaiʻi island.

New Threats:

- Ungulate degradation of habitat—Axis deer (*Axis axis*) and mouflon sheep (*Ovis musimon*) modify and degrade habitat by disturbing and destroying vegetative cover, trampling plants and seedlings, reducing or eliminating plant regeneration by damaging seeds and seedlings, and increasing erosion by creating large areas of bare soil. In addition to areas discussed in the previous 5-year reviews, these ungulates and evidence of their activities have been observed on Lānaʻi at the Keone, Māhāʻulepū, Mānele, and Naupaka occurrences of *Abutilon menziesii* (NTBG Herbarium 2013a, 2013b; PEPP 2012, 2017b).
- Climate change loss 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 Hawaiʻi 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 *Abutilon menziesii* is highly vulnerable to the impacts of climate change, with a vulnerability score of 0.564 (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.
- Drought degradation of habitat or mortality—Drought is noted as a threat to the occurrences of *Abutilon menziesii* on Maui (Waikapu), Lānaʻi (Paliamano, Māhāʻulepū, and Mānele), and Hawaiʻi island (Kaʻūpūlehu) (PEPP 2013, 2014, 2017b). Over the past 100 years, the Hawaiian Islands have experienced an annual decline in precipitation from just over 9 percent, to as much as 15 percent within the last 20 years (US-NSTC 2008; Chu and Chen 2005; Diaz 2005). Drought affects plants directly by desiccation (D'Antonio and Vitousek 1992). The increase in drought frequency and intensity leads to a self-perpetuating cycle of increase in cover of nonnative plants, increase in the number of fires, and an increase of erosion (US-GCRP 2009; Warren 2011). Recent episodes of drought have also driven deer farther into urban and forested areas in search of food,

increasing their negative impacts to native vegetation from herbivory and trampling (Waring 1996, in litt; Nishibayashi 2001, in litt.).

- Human interaction monitoring and management—Habitat disturbance by human visitation of occurrences at Paliamano on Lānaʻi is noted as a threat to *Abutilon menziesii* (PEPP 2013).
- Lack of adequate hunting regulations—Three of the five known occurrences of *Abutilon menziesii* on Lānaʻi occur in a State Game Management Area. Nonnative feral ungulates pose a major ongoing threat to native species through destruction and modification of habitat, and through direct herbivory or predation. Only some of the occurrences are fenced and habitat destruction and modification, and predation, by axis deer and mouflon sheep are noted as threats to the species. In addition, public hunting areas are not fenced and game mammals have unrestricted access to most areas across the landscape, regardless of underlying land use designation; therefore, any unfenced populations are at risk (DLNR 2010).
- Lack of adequate biosecurity legislation—Invasion of the State of Hawaiʻi by invasive nonnative plant species, and destruction of habitat and competition by nonnative plants are threats to *Abutilon menziesii.* The U.S. Department of Agriculture, Animal and Plant Health Inspection Service, Plant Protection and Quarantine, is authorized to prevent the introduction or dissemination of animal and plant pests on all ships, aircraft, and their cargo and baggage arriving in the U.S. and its territories; however, pest species continue to enter the State. In addition, Federal import regulations do not address many species that could be pests in Hawaiʻi (CGAPS 2009; Ikuma *et al.* 2002).

New Management Actions:

- Captive propagation for genetic storage and reintroduction—There are thousands of seeds of *Abutilon menziesii* in storage and some plants in living collections. The National Tropical Botanical Garden (NTBG) has collections from Lānaʻi (15 seeds from six individuals at Naupaka, 440 seeds from individuals at Keone, 41 seeds from individuals at Mānele, and over 1,000 seeds from individuals at Puu Māhanalua) (NTBG 2014). The Plant Extinction Prevention program (PEPP) reports collections of seeds from eight founders at Manele and 240 seeds from eight founders at Paliamano Gulch (PEPP 2017a). Waimea Arboretum has plants from Lānaʻi as living collections (Waimea Arboretum 2013, 2014, 2015). The Lyon Seed Conservation Laboratory has 648 seeds in storage representing eight wild plants at Kalialinui, east Maui (Lyon Arboretum 2013, 2016; PEPP 2017a). NTBG reports 60 seeds collected from individuals at Kekuawahaʻulaʻula, 60 seeds from individuals at Makawao, and almost 2,000 seeds from individuals at Puʻu o Kali, east Maui (NTBG 2013, 2014). MNBG reports 100s of seeds collected from five individuals at Puʻu o Kali, east Maui (MNBG 2013, 2014, 2015). The Olinda Rare Plant Facility (ORPF) has four potted plants from Pōhākea, west Maui (ORPF 2013, 2017). The Fleming Arboretum reports planting 12 seedlings on east Maui (Fleming Arboretum 2017). Waimea Arboretum has a few plants as living collections from Maui (Waimea Arboretum 2013, 2014, 2015). PEPP reports 12 individuals outplanted at Waikapū, west

Maui (PEPP 2013, 2015). On Oahu, an HCP was established for this species, and one Contingency Reserve Area and three mitigation sites were established. Hundreds of plants have been propagated and outplanted at Diamond Head State Park, Honouliuli Refuge, and Pouhala Marsh on Oahu. There is an additional site established at Kahuku, and a small population was established at ʻEwa Villages Golf Course (77 individuals). In addition, there is a living collection at Koko Crater Botanical Garden with 62 plants representing 45 percent of the original population (DOFAW 2016). The HCP has reached its 20-year timeline; however, and meetings have been held to determine continued funding for management of the outplantings (DOFAW 2017). Additional sites are also under consideration. On Hawaiʻi island there are outplantings at Kaʻūpūlehu Mauka (many individuals) and at Kealakekua (4 individuals, these may be hybrids) (PEPP 2014, PEPP 2017a).

- A private organization, Pūlama Lānaʻi, provides significant conservation benefits for 38 plants and two Lānaʻi tree snail species on Lānaʻi, including *Abutilon menziesii*, as demonstrated by the ongoing conservation efforts on the island, the commitment to develop the Lānaʻi Natural Resources Plan (LNRP), and a memorandum of understanding (MOU) with the Service (USFWS 2015).

Synthesis:
No new wild populations have been reported since the last 5-year review for *Abutilon menziesii*. About 60 individuals occur on Oʻahu, and a little over 200 individuals on Maui. Seed collections and reintroductions from outplanted or greenhouse material are ongoing. A landscape-based assessment of climate change vulnerability for native plants of Hawaiʻi using high resolution climate change projections was made by Fortini *et al.* (2013) and their analysis showed that *A. menziesii* is highly vulnerable to the effects of climate change. Only the Oʻahu plants are well-represented in collections and outplantings.

Stabilizing (interim), downlisting, and delisting objectives were provided in the Recovery Plan for the Lānaʻi Plant Cluster (USFWS 1995), 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.

Abutilon menziesii is a long-lived perennial shrub, with a formerly broad continuous range on four islands. 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 (or the total number of individuals if fewer than 50 exist) from each of three populations represented in an *ex situ* (secured off-site, such as a nursery or seed bank)

collection. In addition, a minimum of three populations should be documented on O‘ahu and at least one other island where they now occur or occurred historically and each of these populations must be naturally reproducing (*i.e.,* viable seeds, seedlings, saplings), with a minimum of 25 mature, reproducing individuals per population.

The preventing extinction goals for this species have not been met. Although there may be more than three populations that total 25 individuals, it is uncertain how many individuals are mature, all threats are not being managed (Table 1), and genetic storage is incomplete (Table 2). Therefore, *Abutilon menziesii* meets the definition of Endangered as it remains in danger of extinction throughout its range.

Recommendations for Future Actions:
Habitat destruction and modification, and predation, by axis deer and mouflon sheep are observed to negatively affect *Abutilon menziesii* on Lāna‘i, and drought is a new threat to occurrences on Maui and Lāna‘i. However, this information does not change the species’ biological status since the last 5-year review. Thus, the following recommendations for future actions are added or reiterated for the 5-year review for 2018.

- Surveys and inventories—Survey for occurrences of *Abutilon menziesii* in historic habitat on Hawai‘i island.
- 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 habitat disturbances from feral ungulates.
- 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.
- Climate change adaptation strategy—Assess the modeled effects of climate change on this species, and determine future landscape needed for the recovery of the species.
- Fire monitoring and control—Develop and implement fire prevention management plans.
- Captive propagation for genetic storage and reintroduction—Continue collection and propagation efforts for maintenance of genetic stock.
- Reintroduction and translocation—Continue to reintroduce individuals into suitable habitat within historic range that is being managed for known threats to this species.

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

Date	No. wild individuals	No. outplanted	Stability Criteria identified in Recovery Plan	Stability Criteria Completed?
1986 (listing)	67	0	All threats managed in all three populations	No
			Complete genetic storage	No
			Three populations with 25 mature individuals each	No
1995 (recovery plan)	600 (Lānaʻi) 45 (Maui) 38 (Hawaiʻi) 0 (Oʻahu)	unknown	All threats managed in all three populations	No
			Complete genetic storage	Partially
			Three populations with 25 mature individuals each	Partially
2011 (5-year review)	100s (Lānaʻi) 220 (Maui) 0 (Hawaiʻi) 40–60 (Oʻahu)	100s	All threats managed in all three populations	No
			Complete genetic storage	Partially
			Three populations with 25 mature individuals each	Partially
Date	**No. wild individuals**	**No. outplanted**	***Preventing Extinction Criteria identified by HPPRCC**	***Preventing Extinction Criteria Completed?**
2018 (5-year review)	< 300	100s	All threats managed in all three populations	No
			Complete genetic storage	Partially

			Reproduction (*i.e.* viable seeds, seedlings) at all three populations	No
			Three populations with 25 mature individuals each on more than one island	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 after Preventing Extinction).

Table 2. Threats to *Abutilon menziesii* and ongoing conservation efforts.

Threat	Listing factor	Current Status	Conservation/ Management Efforts
Ungulate degradation of habitat	A	Ongoing	Partial, some fencing of reintroduced individuals
Established ecosystem altering invasive plant species degradation of habitat	A	Ongoing	Partial, some fencing of reintroduced individuals
Agricultural and urban development loss or degradation of habitat	A	Ongoing	None
Climate change degradation or loss of habitat	A	Ongoing	None
Fire destruction or degradation of habitat	A	Ongoing	None
Ungulate predation or herbivory	C	Ongoing	None
Rodent predation or herbivory	C	Ongoing	None
Invertebrate predation or herbivory	C	Ongoing	None
Lack of adequate hunting regulations	D	Ongoing	Partial, some fencing of reintroduced individuals
Lack of adequate biosecurity legislation	D	Ongoing	None
Invasive species—Established invasive plant species competition	E	Ongoing	Partial, some fencing of reintroduced individuals
Stochastic events—Drought mortality and reduced viability	E	Ongoing	Partial–Propagation, seed storage, and reintroduction efforts are ongoing

References:
See previous 5-year review for a full list of references (USFWS 2011). Only references for new information are provided below.

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

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[PEPP] 2017a. Statewide species totals *ex situ*, excel table.

[PEPP] 2017b. PEPP semiannual report fiscal year 2017, January-March.

[PEPP] 2018. PEPP report for April, 2018. Excel table.

[USFWS] U.S. Fish and Wildlife Service. 2011. *Abutilon menziesii* 5-year review summary and evaluation. USFWS Pacific Islands Fish and Wildlife Office, Honolulu, HI. *https://ecos.fws.gov/docs/five_year_review/doc3798.pdf.*

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U.S. FISH AND WILDLIFE SERVICE
SIGNATURE PAGE for 5-YEAR REVIEW of *Abutilon menziesii* (ko‘oloa‘ula)

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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