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. 2021. Endangered and Threatened Wildlife and Plants; Initiation of 5-Year Status reviews for 77 Species in Oregon, Washington, Idaho, and Hawaii. Federal Register 86(120):33726–33728, June 25, 2021.

Lead Region/Field Office:

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

Name of Reviewer:

Cheryl Phillipson, Biologist, PIFWO
Lauren Weisenberger, Plant Recovery Coordinator, PIFWO
Megan Laut, Recovery 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 October 2021. The review was based on a review of current, available information since the last 5-year review for *Abutilon menziesii* (USFWS 2018). The evaluation by Cheryl Phillipson, Biologist, was reviewed by Lauren Weisenberger, Plant Recovery Coordinator, and Megan Laut, Recovery 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/ecp/species/3268*).

Review Analysis:

Please refer to the previous 5-year reviews for *Abutilon menziesii* published in the Federal Register on August 2, 2011, and October 23, 2018 (available at *https://ecos.fws.gov/docs/tess/species_nonpublish/1743.pdf* and *https://ecos.fws.gov/docs/tess/species_nonpublish/2609.pdf*) for a complete review of the species' status, threats, management efforts, and references cited. 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 is known from the islands of Oʻahu, Lānaʻi, Maui, and Hawaiʻi. The status and trends for *Abutilon menziesii* are provided in the tables below.

New Status Information:

Currently, there are two wild populations on Oʻahu, three wild populations on Lānaʻi, and three wild populations on Maui. On Oʻahu, there were 35 individuals (some wild) at Kapolei in 2018, and 45 mature and one immature wild individuals in three subpopulations at Lualualei in 2022 (Department of Land and Natural Resources Division of Forestry and Wildlife [DLNR DOFAW] 2019, 12 pp.; Waianae Mountains Watershed Partnership [WMWP] 2022, 13 pp.). On Lānaʻi, the wild populations are found at Puʻumāhanalua (approximately 200 individuals in multiple clusters), at Mānele (3 to 13 individuals; however, two of the four subpopulations were impacted by a wildfire); and at Paliamano there are at least 13 individuals with additional multiple clusters in four subpopulations, some of which are within an exclosure (Pūlama Lānaʻi 2021). In 2019, there were multiple clusters in an exclosure at Keone in Paliamano (down from several hundred in 2011) (Pūlama Lānaʻi 2021). On east Maui, wild individuals may still occur at Puʻuokali and Kalialinui Gulch with the last counts of 200 and 8 individuals (respectively) in 2018 (USFWS 2018). An historic occurrence on west Maui could not be relocated; however, another occurrence was found in a nearby area at Pōhākea and is estimated to total 15 to 30 individuals (Maui PEPP 2022). Wild individuals on the island of Hawaiʻi are extirpated but there are seeds in *ex situ* storage (Keir 2018; Lyon Arboretum 2022).

New Threats:

- None reported.

New Management Actions:

- Monitoring and surveys—The DLNR DOFAW monitors and surveys wild, *inter situ*, and *ex situ* populations on Oʻahu as part of the criteria for the Habitat Conservation Plan (HCP) developed in 2004 (DLNR DOFAW 2019, 12 pp.). Oʻahu populations are also monitored by the Plant Extinction Prevention Program (PEPP) (PEPP 2021, p. 25; PEPP 2022, p. 26). Wild and augmented populations on Lānaʻi are monitored by Pūlama Lānaʻi (Pūlama Lānaʻi 2021). Occurrences on Maui are monitored by the Maui Plant Extinction Prevention Program (Maui PEPP 2022). Populations at Lualualei (Oʻahu) are monitored by the WMWP (2022, 13 pp.). Populations in botanical gardens are regularly monitored and are used for propagation and seed collection and storage purposes.
- Ungulate monitoring and management—Fencing is monitored and maintained on Oʻahu at Honouliuli and the Kapolei Contingency Reserve Area (CRA) (DLNR DOFAW 2019, 12 pp.); on Maui at Puʻuokali (USFWS 2018); and on Lānaʻi at Keone (Keir 2018), Paliamano, and Mānele (Keir 2018; Pūlama Lānaʻi 2021).
- Invasive nonnative plant management—On Oʻahu, nonnative plants are controlled at all subpopulations of *Abutilon menziesii* at Lualualei (WMWP 2018, 2022), at Koko Crater Botanical Garden, the Kapolei CRA, and Hāmākua Marsh (DLNR DOFAW 2019). On Lānaʻi, nonnative plants are controlled at Mānele (Pūlama Lānaʻi 2021).

- Fire management—The WMWP is forming a wildland fire working group, and planning roadside vegetation management and interdepartmental drills for fire response at Lualualei (WMWP 2022). There is a firebreak at the Kapolei CRA area (DLNR DOFAW 2019).
- Control of predation and herbivory by rodents—The WMWP sets rodent traps at two subpopulations of *Abutilon menziesii* at Lualualei and monitors them quarterly (WMWP 2022).
- Collection and propagation for genetic storage and reintroduction—
    - On Oʻahu, the HCP developed in 2004 for this species established a Contingency Reserve Area (CRA) with wild plants and three mitigation sites for translocations. In 2018, a wild plant was discovered at Lualualei Naval Magazine (in addition to plants found in 2011). Between 2018 and 2019, eight translocation sites were established on Oʻahu: one at Diamond Head, with clones of Kapolei plants, totaling 68 mature plants representing 57 percent of the founders. There are 90 plants representing 60 percent of the Kapolei founders at Koko Crater Botanical Garden, and this is the most robust population. The Honouliuli (West Loch Pearl Harbor) fenced site has 71 plants representing 54 percent of the Kapolei founders. The Kapolei CRA originally had several dozen wild plants and is fenced. Currently 35 individuals remain, some wild and some outplanted; however, this site is water-limited and there has been no recruitment observed in 10 years. The Pouhala Marsh site totals 42 mature plants. The Hāmākua Marsh site totals 65 plants; however, only 30 remain due to flooding. The Mākua Keaʻau site, originally established for outplanting of *Gouania vitifolia* and subsequently burned in a fire, now has 30 individuals outplanted (PEPP 2019, p. 20). The Waiʻanae Kai site currently has 25 individuals (DLNR DOFAW 2019, 12 pp.). These eight sites totaled 361 reintroduced plants, representing at least 60 percent of the Kapolei founders, in 2019. The short-term criteria for the HCP of more than 25 percent of the genetic lineages surviving after two years at all three sites, with the recruitment of seedlings, have been met. However, the long-term criteria of three populations containing 80 percent reproducing mature plants with replacement by recruits have not been met (DLNR DOFAW 2020, 20 pp.). Funding for this project was expended by 2019 but further management is needed.
    - Collections of fruit from plants on Oʻahu is conducted by PEPP (2021, p. 25; 2022, p. 26). Also, on Oʻahu, 12 individuals were translocated to Kaʻena in 2020 (PEPP 2020, pp. 10–11).
    - In 2023, Maui PEPP collected seeds from three founders in the new population at Pōhākea and distributed them to Lyon Arboretum for storage (Maui PEPP 2023).
    - Between 2019 and 2021, the Lyon Seed Conservation Laboratory reported storage of seeds representing wild and translocated plants on Lānaʻi: 417 seeds representing two founders from the Mānele population, 3,642 seeds representing eight founders from Paliamano, and 150 seeds representing one founder from Puʻumāhanalua. From Oʻahu, more than 12,000 seeds are stored representing 26 *inter situ* plants at Lēʻahi (Diamond Head), 1,638 seeds are

stored representing two founders from Lualualei, 307 seeds are stored representing two first generation plants at Pouhala Marsh, and more than 34,000 seeds are stored representing 26 first generation plants from founders at Kapolei. Almost 600 seeds are stored from at least one founder from Pu‘uokali on Maui. In addition, there are 274 seeds stored from one plant from the Waikoloa Dry Forest area on the island of Hawai‘i (Lyon Arboretum 2022).

- In 2021, the Maui Nui Botanical Garden (MNBG) reported six individuals of *Abutilon menziesii* in a living collection. In addition, MNBG reported storage of more than 5,000 seeds representing translocated individuals at Wai‘ehu, Ahihi-Kinau, Kailua Gulch, Kalialinui, and from plants in the living collection (MNBG 2021).
- In 2018, the National Tropical Botanical Garden (NTBG) reported one plant (sourced from a Pu‘umāhanalua founder) in a living collection at the Southshore Garden represented by 484 seeds in storage, and one plant in the nursery (sourced from Pu‘u Māhanalua) represented by 1,460 seeds in storage (NTBG 2022).
- Waimea Valley Arboretum reports cloned plants from Barber’s Point in a living collection with additional plants representing five founders from Lāna‘i and Maui (Waimea Valley Arboretum 2018; Keir 2018 p. 44).
- In 2020, the Waimano Nursery reported two plants stored representing two individuals in a collection at Koko Crater Botanical Garden. In 2021, the Dillingham Nursery reported storage of nine plants representing six individuals in the collection at Koko Crater Botanical Garden (O‘ahu DOFAW Rare Plant Nurseries 2021).
- As of 2020, Pūlama Lāna‘i reported 78 seedlings representing one founder at Paliamano, and two plants representing a second founder. There were nine plants produced sourced from seeds pooled from three founders at Pu‘u Māhanalua, and three plants representing one founder from Mānele (Pūlama Lāna‘i 2021). Pūlama Lāna‘i also reports thousands of seeds in storage: 73 seeds collected from four founders at Mānele; more than 2,000 seeds collected from 17 founders at Paliamano; and 470 seeds (100 sent to Lyon Arboretum) representing three founders at Pu‘u Māhanalua (Pūlama Lāna‘i 2021).

- Translocation and Augmentation—
  - Between 2018 and 2019, plants were translocated to eight sites on O‘ahu: 68 plants at Lē‘ahi (Diamond Head) representing 57 percent of the founders at Kapolei, 90 plants at Koko Crater Botanical Garden representing 60 percent of the Kapolei founders, 70 plants at Honouliuli representing 54 percent of the Kapolei founders, 42 plants at Pouhala Marsh, 65 plants at Hāmākua Marsh (30 remain), and 25 plants at Wai‘anae Kai (DLNR DOFAW 2019). In addition, there are 35 plants at the Kapolei CRA, some of which are wild (DLNR DOFAW 2019). In addition, 75 plants were reintroduced at the Ewa Villages (Keir 2018). In 2020, the PEPP reported 12 individuals reintroduced at Ka‘ena Point (PEPP 2020). Recruitment is observed at Lē‘ahi, Honouliuli, and Pouhala Marsh (DLNR DOFAW 2019, 12 pp.).

- In 2021, Pūlama Lānaʻi reported augmentation of a wild population in the Keone exclosure in Paliamano with 51 mature and 161 immature plants sourced from Paliamano founders (Pūlama Lānaʻi 2021) and augmentation of a subpopulation in the Puʻu Māhanalua exclosure with 59 plants; 28 sourced from Mānele founders and 40 sourced from Puʻu Māhanalua founders (Pūlama Lānaʻi 2021). An additional 15 plants were added in 2021 (source not indicated).

- Genetic research—In 2018, a study was conducted regarding the possibility of hybridization of *Abutilon menziesii* with other *Abutilon* species (Morden et al. 2018 in DLNR DOFAW 2019, pp. 45–58). Both *A. menziesii* and *A. eremitopetalum* occur in sympatry on Lānaʻi, and hybridization may have occurred there naturally (Morden et al. 2018 in DLNR DOFAW 2019, p. 44). However, this study was conducted with the focus on determining if individuals of *A. menziesii* reintroduced on the island of Hawaiʻi stemmed directly from the island's original population or if the plants may be hybrids and if efforts should then be made to isolate pure genetic representative materials to establish new reintroductions on that island (Morden et al. 2018 in DLNR DOFAW 2019, p. 44). The study showed that significant genetic diversity was still found in *A. menziesii* populations among those occurring on each of four Hawaiian islands (Morden et al. 2018 in DLNR DOFAW 2019, p. 51).

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 3 populations	No
			Complete genetic storage	No
			3 populations with 25 mature individuals each	No
2011 (5-year review)	100s (Lānaʻi) 220 (Maui) 40–60 (Oʻahu) 0 (Hawaiʻi)	100s	All threats managed in all 3 populations	No
			Complete genetic storage	Partially
			3 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 3 populations	No
			Reproduction (i.e., viable seeds, seedlings) at all 3 populations	No
			Complete genetic storage	Partially
			3 populations with 25 mature individuals each	No
Date	**No. wild individuals**	**No. outplanted**	**Interim Criteria identified by HPPRCC**	**Interim Criteria Completed?**
2023 (5-year review)	ca 500+ (Lānaʻi) ca 200 (Maui) ca 65 (Oʻahu) 0 (Hawaiʻi)	130 mature, 220 immature (Lānaʻi) 4 sites unknown numbers (Maui) >300 (Oʻahu) 0 (Hawaiʻi)	All threats managed in all 3 populations	Partially
			Complete genetic storage	Nearly complete
			Natural reproduction at all 3 populations	Partially, 1 population on Lānaʻi and 2 populations on Oʻahu
			3 populations with 100 mature individuals each	Partially, 2 populations > 100 individuals on Lānaʻi and east Maui, with natural recruitment at small Oʻahu populations

* 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 stage after Preventing Extinction).

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

Threat	Listing factor	Current Status	Conservation/ Management Efforts
Degradation and destruction of habitat by feral ungulates	A	Ongoing	Partial, 2 exclosures on O‘ahu, 1 exclosure on Maui, 4 exclosures on Lāna‘i
Established ecosystem altering invasive plant species degradation of habitat and competition	A, E	Ongoing	Partial, nonnative plant control within exclosures
Drought destruction and degradation of habitat	A	Ongoing	None
Agricultural and urban development loss or degradation of habitat	A	Ongoing	Partial, augmentation of wild populations and translocations, some populations within 7 exclosures
Climate change degradation or loss of habitat	A	Ongoing	None
Degradation and destruction by fire	A	Ongoing	Partial, fire management at Lualualei
Predation and herbivory by feral ungulates	C	Ongoing	Partial, 2 exclosures on O‘ahu, 1 exclosure on Maui, 4 exclosures on Lāna‘i
Predation and herbivory by rodents	C	Ongoing	Partial, traps set and monitored at Lualualei
Predation and herbivory by invertebrates	C	Ongoing	None
Lack of adequate hunting regulations	D	Ongoing	Partial, 2 exclosures on O‘ahu, 1 exclosure on Maui, 4 exclosures on Lāna‘i
Lack of adequate biosecurity legislation	D	Ongoing	None
Reduced viability due to drought mortality	E	Ongoing	Partial, propagation, seed storage, augmentation and translocation efforts are ongoing

Synthesis:
Currently there are approximately 765 wild individuals of *Abutilon menziesii* on Oʻahu, Lānaʻi, and Maui. Seven populations are provided protection by fencing and nonnative plant control. Seed collections, propagation, and augmentation and translocation are ongoing. Almost all known wild plants are represented in seed storage, living collections, and translocations.

Stabilizing (interim), downlisting, and delisting objectives are provided in the Lānaʻi Plant Cluster Recovery Plan (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. To reach interim stabilization goals, the second 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 *adequately* represented in *ex situ* (secured off-site, such as a nursery or seed bank) collections that are well managed. In addition, a minimum of a total of three populations of 100 mature individuals each should be documented on Lānaʻi and at least one other island where the species now occurs or occurred historically and each of these populations must demonstrate regeneration

The interim stabilization goals for *Abutilon menziesii* have not been met. Although genetic storage is nearly complete (Table 1), there are only two populations totaling more than 100 individuals (on Lānaʻi and east Maui), and only two smaller reintroduced populations on Oʻahu showing natural recruitment (Table 1). In addition, the short-term criteria of the HCP for an occurrence on Oʻahu have been met; however, funding for these actions has been expended, and the long-term criteria have not been met. The current status of the largest population on Maui is unknown, although a new, very small population has been recently discovered. Threats including predation by invertebrates and drought have not been addressed, and predation by rodents and wildfire are addressed at only one population each (Table 2). In summary, efforts are needed to reach at least interim goals of recovery for wild and translocated plants on Lānaʻi and also to maintain at least one population at interim goals of recovery on Maui or Oʻahu. Therefore, *Abutilon menziesii* meets the definition of Endangered as it remains in danger of extinction throughout its range.

Recommendations for Future Actions:
No significant new information regarding the species' biological status has been reported since the last 5-year review in 2018. Thus, the following recommendations for future actions are updated or reiterated for the 5-year review for 2023.

- Surveys and inventories—Continue surveys for populations of *Abutilon menziesii* in areas of potentially suitable habitat.
- Ungulate monitoring and control—Continue to maintain fenced exclosures and construct additional exclosures to protect individuals from the negative impacts of habitat destruction and trampling and browsing by ungulates.
- Invasive nonnative plant monitoring and control—Continue control of established ecosystem-altering nonnative invasive plant species, and those that compete with *A. menziesii*.
- Fire prevention and control—Continue to develop and implement fire prevention management plans for all populations.
- Climate change adaptation strategy—Research suitability of habitat for viability of species, including sites for translocations in the future due to the impacts of climate change.
- Predator and herbivore monitoring and control—
    - Determine effective methods to control insect pests, including Hibiscus snow scale (*Pinnaspis strachani*) and the Chinese rose beetle (*Adoretus sinicus*), and implement if necessary.
    - Implement effective methods to control predation by mice and rats at all populations.
- Captive propagation for genetic storage and reintroduction—Continue collection and propagation efforts for maintenance of genetic stock and for translocation.
- Build resiliency, redundancy, and representation—
    - Increase the species' viability through habitat restoration and threat control.
    - Continue to augment wild populations and translocate individuals into suitable habitat that is being managed for known threats to this species to reduce impacts of predation, drought, and lack of biosecurity legislation.
- Population biology research—Determine possible causes of the low rate of natural recruitment.
- Alliance and partnership development—Continue to work with partners and other land managers in planning and implementation of ecosystem-level restoration and management to benefit this species.

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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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