5-YEAR REVIEW

Short Form Summary

Species Reviewed: *Bonamia menziesii* (no common name)

Current Classification: Endangered

Federal Register Notice announcing initiation of this review:

[USFWS] U.S. Fish and Wildlife Service. 2019. Endangered and threatened wildlife and plants; initiation of 5-year status reviews for 91 species in Oregon, Washington, Hawaii, and American Samoa. Federal Register 84(112): 27152–27154, June 11, 2019.

Lead Region/Field Office:

Interior Region 12/Pacific Islands Fish and Wildlife Office (PIFWO), Honolulu, Hawai‘i

Name of Reviewer:

Cheryl Phillipson Biologist, PIFWO
Lauren Weisenberger, Plant Recovery Coordinator, PIFWO
Megan Laut, 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 October 2020. The review was based on a review of current, available information since the last 5-year review for *Bonamia menziesii* (USFWS 2013). The evaluation by Cheryl Phillipson, Biologist, was reviewed by Lauren Weisenberger, Plant Recovery Coordinator, and Megan Laut, 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 reviews for *Bonamia menziesii* in the Federal Register on August 27, 2010 and August 15, 2013 (available at *https://ecos.fws.gov/docs/five_year_review/doc3324.pdf* and *https://ecos.fws.gov/docs/five_year_review/doc4191.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 *B. menziesii*.

This short-lived perennial liana (woody vine) in the Convolvulaceae (morning glory) family is endangered and endemic to the islands of Kaua‘i, O‘ahu, Moloka‘i, Lāna‘i, Maui, and Hawai‘i. The status and trends for *Bonamia menziesii* are provided in the tables below.

New Status Information:

- In 2012, critical habitat was designated for *Bonamia menziesii* on Oʻahu in 21 units in the lowland dry, lowland mesic, and dry cliff ecosystems (3,272 hectares [ha]; 9,753 acres [ac]) (77 FR 57648, September 18, 2012). In 2016, critical habitat was designated for *B. menziesii* on Molokaʻi in three units in the lowland dry and lowland mesic ecosystems (9,383 ha; 13,787 ac), and on Maui in nine units in the lowland dry, dry cliff, and wet cliff ecosystems (8,669 ha; 21,424 ac), and with 4,521 ha (11,172 ac) proposed in one unit in the lowland mesic ecosystem on Lānaʻi but excluded in the final rule (77 FR 34464, June 11, 2012; 81 FR 17790, March 30, 2016).
- Currently, there are at least 13 individuals observed at six locations on Kauaʻi, with a new population discovered in Waimea Canyon in 2017 (15 to 30 individuals) (Tangalin and DeMotta 2017, p. 9); three individuals at three locations on Oʻahu; possibly one immature plant on Lānaʻi; fewer than 50 individuals on east and west Maui; and possibly 19 individuals at two locations on the island of Hawaiʻi (PEPP 2012, 2013, 2014, 2016, 2017, 2018, 2019, 2020). These are direct observations (approximately 100 individuals total) although there may be more plants unreported.

New Threats:

- 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 concluded that *Bonamia menziesii* is vulnerable to the impacts of climate change with a vulnerability score of 0.3 (on a scale of 0 being not vulnerable to 1 being extremely vulnerable to climate change). Therefore, additional management actions may be needed to conserve this taxon into the future, such as locating key microsites that overlap with current and future climate envelopes for outplanting efforts.
- In 2015 to 2018, seed predation by rats was reported to be a threat to populations of *B. menziesii* on Kauaʻi at Paʻaiki and on Maui at Honokōwai, Kanaio, Puʻuokali, and Ukumehame (as submitted to BioPacifica by Perlman and Wood, 2 MAR 2017; Oppenheimer and Bustamente, 29 AUG 2018; Oppenheimer and Padgett, 22 DEC 2015; Oppenheimer, 13 APR 2018; Oppenheimer, Bustamente and Lum 18 JAN 2018).

New Management Actions:

- Surveys and inventories—PEPP continues to survey for and monitor populations on Kauaʻi, Oʻahu, Lānaʻi, Maui, and Hawaiʻi (PEPP 2012, 2013, 2014, 2016, 2017, 2018, 2019, 2020). The National Tropical Botanical Garden (NTBG) discovered a new population of *Bonamia menziesii* when searching for *Alectryon macrococcus* var. *macrococcus* in Waimea Canyon, Kauaʻi (Tangalin and DeMotta 2017, 30 pp.).
- Ungulate monitoring and control—Fenced areas (some areas are not currently occupied) include Kānepuʻu (Lānaʻi), and Honokōwai Ditch Trail, Kahikinui,

Kanaio, and Pu‘uokali on Maui, and Kawai‘ula (Kaua‘i) (PEPP 2011, 2013, 2018). PEPP improved the fencing at Lualaʻilua (east Maui) in 2014.

- Invasive nonnative plant control—PEPP conducts nonnative plant control at Lualaʻilua and Kanaio (Maui) (PEPP 2017, 2019, 2020).
- Collection and propagation—
    - Lyon Arboretum Micropropagation Laboratory reported six explants representing three founders from Kaua‘i (Lyon Arboretum 2020). The Lyon Arboretum Seed Conservation Laboratory reported storage of 166 seeds from O‘ahu and Hawai‘i for research purposes. In addition, more than 1,000 seeds are in storage representing one founder from Kānepu‘u, Lāna‘i; one founder from a living collection at Koko Crater, O‘ahu; and from Maui, one founder from Ukumehame, approximately 10 founders from Lualaʻilua, and approximately six founders from Pu‘uokali (Lyon Arboretum 2020).
    - PEPP reported collection of seeds representing three founders from Kahikinui (east Maui) and cuttings and seeds from plants at Ukumehame (west Maui) in 2013. In 2014 and 2017, PEPP collected seeds from Lualaʻilua (five founders) to send to ORPF. In 2019, seeds were collected from Pu‘uokali and sent to Lyon Arboretum. Between 2020 and 2021, seeds were collected from plants at Pualu‘u and sent to Lyon Arboretum.
    - In 2017, there was collection of 513 seeds from plants in the Ka‘ūpūlehu dryland forest reserve, Hawai‘i (Ka‘ūpūlehu 2019).
    - The Army Natural Resources Program (ANRP) reported storage of 200 seeds representing one founder in the Mākua Military Reservation, O‘ahu (ARNP 2019).
    - From 2016 to 2020, the National Tropical Botanical Garden (NTBG) collected and stored of 260 seeds from plants in their living collections, representing eight founders from wild populations at Mt. Kahili, Pu‘u Kolo, Manoa Valley, and Kahili-Lāwa‘i. There are 19 plants in the nursery representing four collections from Mt. Kahili and Pu‘u Kolo (NTBG 2020).
    - In 2013, the Olinda Rare Plant Facility (ORPF) propagated eight plants representing one founder from Lualaʻilua (Maui) (ORPF 2020).
    - In 2019, the State’s Pahole Rare Plant Facility reported propagation and storage of three plants representing at least one founder from O‘ahu (Pahole 2019).
    - Between 2013 and 2019, the Volcano Rare Plant Facility (VRPF) propagated and stored three plants representing one founder from Maui, 12 plants representing one founder from North Kona (Hawai‘i), and nine plants representing one founder from Ka‘ūpūlehu (Hawai‘i) (VRPF 2020).
    - In 2013, Waimea Arboretum propagated 30 plants representing four founders from O‘ahu, in 2014, 12 plants remained in storage. In 2015, there was a combination of 20 seeds/plants in storage representing the same four founders. In 2018, there were four seeds in storage representing founders from O‘ahu and Hawai‘i (Waimea Arboretum 2013, 2014, 2015, 2018).

- Reintroduction—
    - Pūlama Lānaʻi reported reintroduction to Maunalei of one plant sourced from Kānepuʻu, and one immature plant at Kaheʻa (Pūlama Lānaʻi 2020).
    - Between 2012 and 2021, the Plant Extinction Prevention Program (PEPP) reported reintroduction of 11 individuals to two sites at Kanaio, currently, five plants remain. An irrigation system was also installed at Kanaio and Lualaʻilua (PEPP 2019).

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

Date	No. wild individuals	No. outplanted	Stability Criteria identified in Recovery Plan	Stability Criteria Completed?
1994 (listing)	28 (Kauaʻi) <150 (Oʻahu) ca 9 (Lānaʻi) 10 (Maui) 1 (Hawaiʻi)	0	All threats managed in all 3 populations	No
			Complete genetic storage	No
			3 populations with 50 mature individuals each	No
1999 (recovery plan)	1,000s (Kauaʻi) <150 (Oʻahu) ca 12 (Lānaʻi) 10–15 (Maui) 1 (Hawaiʻi)	0	All threats managed in all 3 populations	Partially
			Complete genetic storage	No
			3 populations with 50 mature individuals each	Yes
2003 (critical habitat)	36 (Kauaʻi) <100 (Oʻahu) 0 (Molokaʻi) 8 (Maui) 14 (Lānaʻi) 6–8 (Hawaiʻi)	0	All threats managed in all 3 populations	Partially
			Complete genetic storage	No
			3 populations with 50 mature individuals each	No

2010 (5-year review)	52 (Kauaʻi) <65 (Oʻahu) 3 (Lānaʻi) 15–18 (Maui) 3 (Hawaiʻi)	39+	All threats managed in all 3 populations	Partially, ungulate exclosures on Kauaʻi, Lānaʻi, Maui
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	No
2012 (critical habitat, Oʻahu)	<60 (Oʻahu)	0	All threats managed in all 3 populations	Partially
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	No
2013 (5-year review)	2+ (Kauaʻi) unk (Oʻahu) 0 (Lānaʻi) several (Maui) unk (Hawaiʻi) est 150 total	250+	All threats managed in all 3 populations	Partially, ungulate exclosures on Kauaʻi, Lānaʻi, Maui; nonnative plant control in exclosures
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	No
2016 (critical habitat, Maui Nui)	ca 4 (Lānaʻi) 8 (Maui)	0	All threats managed in all 3 populations	Partially. ungulate exclosures on Lānaʻi, Maui; nonnative plant control in exclosures
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	No

Date	No. wild individuals	No. outplanted	*Preventing Extinction Criteria identified by HPPRCC	*Preventing Extinction Criteria Completed?
2021 (5-year review)	13 (Kauaʻi) 3 (Oʻahu) 1 (Lānaʻi) <50 (Maui) ca 19 (Hawaiʻi)	13 planted, 5 survive	All threats managed in all 3 populations	Partially, ungulate exclosures on Kauaʻi, Lānaʻi, Maui; nonnative plant control in exclosures
			Complete genetic storage	Partially, ca 30 founders from at least 12 populations on Kauaʻi, Lānaʻi, Oʻahu, Maui, Hawaiʻi
			3 populations with 50 mature individuals each	No
			Natural reproduction at all 3 populations	None reported

* 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 *Bonamia menziesii* and ongoing conservation efforts.

Threat	Listing factor	Current Status	Conservation/ Management Efforts
Degradation and destruction of habitat by feral ungulates	A	Ongoing	Partial, ungulate exclosures on Kauaʻi, Lānaʻi, Maui
Established ecosystem altering invasive plant species degradation of habitat	A	Ongoing	Partial, nonnative plant control within exclosures
Drought destruction and degradation of habitat	A	Ongoing	None
Fire destruction and degradation of habitat	A	Ongoing	Partial, fire management plan for military training area on Oʻahu
Predation by rats	C	Ongoing	None
Invertebrate predation and herbivory–Beetle, ants, scale	C	Ongoing	None
Military activities	E	Ongoing	Partial, management plan for military training area
Climate change degradation or loss of habitat	E	Ongoing	None

Synthesis:
Currently there are approximately 100 individuals of *Bonamia menziesii* statewide on the islands of Kauai, Oʻahu, Lanai, Maui, and Hawaiʻi. Ungulate exclosures on Kauaʻi, Lānaʻi, Maui protect five sites. Nonnative plant control is ongoing within ungulate exclosures and at reintroduction sites. Seeds are in storage with some propagation; however, reintroductions are not stable with recruitment last reported in 2010. In addition to habitat degradation, predation and herbivory by nonnative rats and invertebrates (*Physomerus grossipes*, ants, and scale) are ongoing threats.

Stabilizing (interim), downlisting, and delisting objectives were provided in the Recovery Plan for the Multi-Island Plants (USFWS 1999) 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.

Bonamia menziesii is a short-lived perennial liana (woody vine). To prevent extinction, which is the first milestone 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 *ex situ* (secured off-site, such as a nursery or seed bank) collections that are well managed. In addition, a minimum of three populations total should be documented on the islands 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 50 mature, reproducing individuals per population.

The preventing extinction goals for this species have not been met. There are approximately 100 wild individuals in only 13 occurrences on Kauaʻi, Oʻahu, Lānaʻi, Maui, and Hawaiʻi and no populations total more than 50 mature, reproducing individuals (Table 1). There are some propagative materials (seeds, cuttings) in storage (Table 1). Not all threats are being managed (Table 2). Therefore, *Bonamia menziesii* meets the definition of Endangered as it remains in danger of extinction throughout its range.

Recommendations for Future Actions:
We are not aware of any new threats or significant new information regarding the species' biological status since the last 5-year review in 2013. Thus, the following recommendations for future actions are reiterated for the 5-year review for 2021.

- Surveys and inventories—Continue to survey geographical and historical range for a current assessment of the species' status.
- Ungulate monitoring and control—Monitor and maintain exclosures and construct additional exclosures or strategic fencing where possible to protect all occurrences.
- Invasive plant monitoring and control—Continue to control established ecosystem-altering nonnative invasive plant species at all occurrences.
- Fire monitoring and control—Continue to develop and implement fire prevention management plans for sites with known occurrences.
- Rodent control—Implement effective control measures for rats at all populations.
- Invertebrate control—Determine impact of predation and herbivory by nonnative invertebrates and develop and implement control methods if necessary.
- Captive propagation for genetic storage and reintroduction—Continue collection of genetic resources for storage, propagation, and reintroduction.
- Reintroduction and translocation—Continue reintroduction into suitable habitat within historical range with protection from threats.
- 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 taxon.

References:

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U.S. FISH AND WILDLIFE SERVICE
SIGNATURE PAGE for 5-YEAR REVIEW of *Bonamia menziesii*
(no common name)

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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