

5-YEAR REVIEW

Short Form Summary

Species Reviewed: *Zanthoxylum dipetalum* var. *tomentosum* (a'e)

Current Classification: Endangered

Federal Register Notice announcing initiation of this review:

[USFWS] U.S. Fish and Wildlife Service. 2013. Endangered and threatened wildlife and plants; Initiation of 5-year status reviews of 44 species in Oregon, Hawaii, Guam, and the Northern Mariana Islands. Federal Register 78(24):8185-8187.

Lead Region/Field Office:

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

Name of Reviewer(s):

Chelsie Javar-Salas, Plant Biologist, PIFWO

Marie Brueggemann, Plant Recovery Coordinator, PIFWO

Kristi Young, Programmatic Deputy Field Supervisor, PIFWO

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 March 4, 2013. The review was based on a review of current, available information since the last 5-year review for *Zanthoxylum dipetalum* var. *tomentosum* (USFWS 2009). The evaluation by Chelsie Javar-Salas, Plant Biologist, was reviewed by the Plant Recovery Coordinator. 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 at: http://ecos.fws.gov/tess_public.

Review Analysis:

Please refer to the previous 5-year review for *Zanthoxylum dipetalum* var. *tomentosum* published on June 2, 2009 (available at: http://ecos.fws.gov/docs/five_year_review/doc2427.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 *Z. dipetalum* var. *tomentosum*.

This long-lived perennial is endangered and endemic to Hawaii Island (USFWS 1998). Only a single population of *Zanthoxylum dipetalum* var. *tomentosum* has ever been known, located on State-owned land at Puu Waawaa on Hualalai. The status and trends for *Z. dipetalum* var. *tomentosum* are provided in the tables below.

New status information:

- In 2011, there were 11 wild individuals at Puu Waawaa (Plant Extinction Prevention Program [PEPP] 2012). In 2013, the 11 wild individuals remained at Puu Waawaa (PEPP 2014). Currently, there are still 11 wild individuals at Puu Waawaa (E. Adkins, Division of Forestry and Wildlife, pers. comm. 2015). The single tree known from Amy B.H. Greenwell Ethnobotanical Garden is dead (P. Van Dyke, Amy B.H. Greenwell Ethnobotanical Garden, pers. comm. 2015).
- Overall, the numbers of individuals have increased from the approximately 13 wild mature individuals reported in the previous 5-year review to approximately 11 wild individuals in 2015.

New threats:

- Climate change destruction 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. The assessment by Fortini *et al.* (2013) concluded that *Zanthoxylum dipetalum* is marginally vulnerable to the impacts of climate change.
- Stochastic events – Drought mortality or reduced viability – Drought may exacerbate the effects of ungulates and has direct adverse impacts on *Z. dipetalum* var. *tomentosum* (PEPP 2011).

New management actions:

- Surveys / inventories – A survey for *Z. dipetalum* var. *tomentosum* was conducted at Puu Waawaa; no new discoveries were reported (State of Hawaii Department of Land and Natural Resources [DLNR] 2014a).
- Ungulate monitoring and control
 - In 2010, the current fenced enclosure was improved to protect the remaining wild individuals at Puu Waawaa (PEPP 2010).
 - The existing enclosures at Puu Waawaa were maintained and monitored for the presence of ungulates (DLNR 2013, 2014a).
- Captive propagation for genetic storage and reintroduction
 - The Volcano Rare Plant Facility (2013) has 10 individuals propagated in their nursery. The Facility propagated 15 plants for reintroductions next year. Meanwhile, 12 individuals were reintroduced at Puu Waawaa. In 2014, the Volcano Rare Plant Facility (2014) had 14 individuals propagated in their nursery and 15 individuals were reintroduced at Puu Waawaa. The Facility propagated 29 individuals for reintroduction next year.
 - Air layering of the wild individuals at Puu Waawaa was conducted (PEPP 2010).
 - In 2013, fruit from five founders of *Z. dipetalum* var. *tomentosum* was collected (DLNR 2013).
 - A shade cloth was placed near the wild trees at Puu Waawaa to aid in the collection of seeds. Seeds and cuttings were collected from multiple founders and provided to Volcano Rare Plant Facility for propagation (PEPP 2014).

- Population viability monitoring and analysis
 - The Plant Extinction Prevention Program (2010) monitored the wild population at Puu Waawaa and recommended upgrading the current fenced enclosure to protect the remaining plants.
 - Six of the 13 wild individuals showed signs of wilting during a drought period in August 2010 (PEPP 2011).
 - In August 2011, the wild individuals were watered to alleviate the effects of drought and the air layers was monitored (PEPP 2012). During that same visit, seeds were collected and given to the Volcano Rare Plant Facility for propagation.
 - The Plant Extinction Prevention Program (2014) monitored the wild population at Puu Waawaa, collected seeds, and added shade cloth under the trees to aid in collecting seeds.
- Reintroduction / translocation – In 2012, two individuals of *Z. dipetalum* var. *tomentosum* were reintroduced and in 2014, an additional 13 individuals were reintroduced (DLNR 2012, 2014b).

Synthesis:

Stabilizing, downlisting, and delisting objectives are provided in the Big Island II: addendum to the recovery plan for Big Island plant cluster (USFWS 1998), based on whether the species is an annual, a short-lived perennial (fewer than 10 years), or a long-lived perennial. *Zanthoxylum dipetalum* var. *tomentosum* is a long-lived perennial, and to be considered stable, the taxon must be managed to control threats (e.g., fenced) and be represented in an *ex situ* (at other than the plant’s natural location, such as a nursery or arboretum) collection. In addition, a minimum of three populations should be documented on the island of Hawaii. Each of these populations must be naturally reproducing and increasing in number, with a minimum of 25 mature individuals per population.

The interim stabilization goals for this species have not been met, as only 11 wild individuals are known (Table 1) and all threats are not being sufficiently managed throughout all of the populations (Table 2). Therefore, *Zanthoxylum dipetalum* var. *tomentosum* meets the definition of endangered as it remains in danger of extinction throughout its range.

Recommendations for Future Actions:

- Surveys / inventories – Survey geographical and historical range for a current assessment of the species’ status.
- Captive propagation for genetic storage and reintroduction – Continue collection of genetic resources for storage, propagation, and reintroduction into protected suitable habitat within historical range.
- Ungulate monitoring and control – Maintain existing enclosures and monitor for potential incursions.
- Invasive plant monitoring and control – Eradicate invasive introduced plants within ungulate enclosures and maintain enclosures free of invasive plants.
- Population viability monitoring and analysis – Continue monitoring outplanted individuals.

- Fire monitoring and control – Develop and implement a fire management plan at the existing exclosures.
- Climate change adaptation strategy – Research the suitability of habitat for reintroducing this species in the future due to the impacts of climate change.
- Alliance and partnership development – Initiate planning and contribute to implementation of ecosystem-level restoration and management to benefit this taxon.

Table 1. Status and trends of *Zanthoxylum dipetalum* var. *tomentosum* from listing through current 5-year review.

Date	No. wild indivs	No. outplanted	Stability Criteria identified in Recovery Plan	Stability Criteria Completed?
1996 (listing)	24	0	All threats managed in all 3 populations	No
			Complete genetic storage	No
			3 populations with 25 mature individuals each	No
1998 (recovery plan)	24	20	All threats managed in all 3 populations	No
			Complete genetic storage	No
			3 populations with 25 mature individuals each	No
2003 (critical habitat)	14	Unknown	All threats managed in all 3 populations	Partially
			Complete genetic storage	No
			3 populations with 25 mature individuals each	No
2009 (5-yr review)	13	19	All threats managed in all 3 populations	Partially
			Complete genetic storage	Partially
			3 populations with 25 mature individuals each	No
2015 (5-yr review)	11	15	All threats managed in all 3 populations	Partially
			Complete genetic storage	Partially
			3 populations with 25 mature individuals each	No

Table 2. Threats to *Zanthoxylum dipetalum* var. *tomentosum* and ongoing conservation efforts.

Threat	Listing factor	Current Status	Conservation/ Management Efforts
Ungulates – degradation of habitat and herbivory	A, C, D, E	Ongoing	Partially, four fences at Puu Waawaa
Invasive introduced plants	A, E	Ongoing	None
Invertebrate predation or herbivory – black twig borer, ants, scales, mealybugs, thrips, and aphids	C	Ongoing	None
Rodent predation or herbivory – rats	C	Ongoing	None
Drought	E	Ongoing	Partially, watered in August 2011
Fire	E	Ongoing	None
Low numbers	E	Ongoing	Partially, captive propagation for genetic storage and reintroduction
Climate change	A, E	Increasing	None

References:

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

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. 141 pages.

Plant Extinction Prevention Program. 2010. Plant Extinction Prevention Program annual report, fiscal year 2010 (July 1, 2009-June 30, 2010). Unpublished report submitted to the U.S. Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office, Honolulu, Hawaii.

[PEPP] Plant Extinction Prevention Program. 2011. Plant Extinction Prevention Program annual report, fiscal year 2011 (July 1, 2010-June 30, 2011). Unpublished report submitted to the U.S. Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office, Honolulu, Hawaii.

[PEPP] Plant Extinction Prevention Program. 2012. Plant Extinction Prevention Program annual report, fiscal year 2012 (July 1, 2011-June 30, 2012). Unpublished report submitted to the U.S. Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office, Honolulu, Hawaii.

- [PEPP] Plant Extinction Prevention Program. 2014. Plant Extinction Prevention Program annual report, fiscal year 2014 (July 1, 2013-June 30, 2014). Unpublished report submitted to the U.S. Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office, Honolulu, Hawaii.
- [DLNR] State of Hawaii Department of Land and Natural Resources. 2012. Department of Land and Natural Resources, Division of Forestry and Wildlife, Section 6 interim report for plant habitat management, Natural Area Reserves, Hawai‘i. July 1, 2011 to June 30, 2012. Unpublished.
- [DLNR] State of Hawaii Department of Land and Natural Resources. 2013. Department of Land and Natural Resources, Division of Forestry and Wildlife, Section 6 final report for plant restoration and enhancement, threatened, endangered, candidate, and species of concern outplanting, Hawaii. July 1, 2012 to June 30, 2013. Unpublished.
- [DLNR] State of Hawaii Department of Land and Natural Resources. 2014a. Department of Land and Natural Resources, Division of Forestry and Wildlife, Section 6 interim report for plant restoration and enhancement, threatened, endangered, candidate, and species of concern outplanting, Hawaii. July 1, 2013 – June 30, 2014. Unpublished.
- [DLNR] State of Hawaii Department of Land and Natural Resources. 2014b. Department of Land and Natural Resources, Division of Forestry and Wildlife, Section 6 final report for plant habitat management, Natural Area Reserves, Hawaii. July 1, 2013 to December 30, 2013. Unpublished.
- [USFWS] U.S. Fish and Wildlife Service. 1998. Big Island II: addendum to the recovery plan for the Big Island plant cluster. U.S. Fish and Wildlife Service, Portland, Oregon. 80 pages + appendices.
- [USFWS] U.S. Fish and Wildlife Service. 2009. *Zanthoxylum dipetalum* var. *tomentosum* 5-year review short form summary. Pacific Islands Fish and Wildlife Office, Honolulu, Hawaii. 7 pages.
- Volcano Rare Plant Facility. 2013. Report on controlled propagation of listed and candidate species, as designated under the U.S. Endangered Species Act. Unpublished.
- Volcano Rare Plant Facility. 2014. Report on controlled propagation of listed and candidate species, as designated under the U.S. Endangered Species Act. Unpublished.

Personal communication:

Adkins, Edith. 2015. Habitat conservation planner, State of Hawaii Department of Land and Natural Resources, Division of Forestry and Wildlife. Email to Chelsie Javar-Salas, Pacific Islands Fish and Wildlife Office, dated August 14, 2015. Subject: ZanDipTom.

Van Dyke, Peter. 2015. Manager, Amy B.H. Greenwell Ethnobotanical Garden. E-mail to Chelsie Javar-Salas, Pacific Islands Fish and Wildlife Office, dated March 28, 2015. Subject: status of *Zanthoxylum dipetalum* var. *tomentosum* at the garden.

U.S. FISH AND WILDLIFE SERVICE
SIGNATURE PAGE for 5-YEAR REVIEW of *Zanthoxylum dipetalum* var.
***tomentosum* (a'e)**

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

Appropriate Listing/Reclassification Priority Number, if applicable: _____

 Programmatic Deputy Field Supervisor, Pacific Islands Fish and Wildlife Office

M. M. Bugman

Date 2015-08-06