5-YEAR REVIEW

Short Form Summary

Species Reviewed: *Xylosma crenatum* (No common name)

Current Classification: Endangered

Federal Register Notice announcing initiation of this review:

[USFWS] U.S. Fish and Wildlife Service. 2007. Endangered and threatened wildlife and plants; initiation of 5-year reviews of 71 species in Oregon, Hawaii, Commonwealth of the Northern Mariana Islands, and territory of Guam. Federal Register 72(45):10547-10550.

Lead Region/Field Office:

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

Name of Reviewer(s):

Christian Torres-Santana, Pacific Islands Fish and Wildlife Office, Student Trainee Biologist
Marie Bruegmann, Pacific Islands Fish and Wildlife Office, Plant Recovery Coordinator
Marilet A. Zablan, Pacific Islands Fish and Wildlife Office, Recovery Program Leader and acting Assistant Field Supervisor for Endangered Species

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 on March 8, 2007. The review was based on the final critical habitat designation for *Xylosma crenatum* and other species from the island of Kauai, as well as a review of current, available information (USFWS 2003). The Bernice P. Bishop Museum provided an initial draft of portions of the five-year review. The evaluation of the status of the species was prepared by our lead PIFWO biologist and reviewed by the Plant Recovery Coordinator. The document was then reviewed by the Recovery Program Leader and acting Assistant Field Supervisor for Endangered Species before submission to the Field Supervisor for approval.

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).

Application of the 1996 Distinct Population Segment (DPS) Policy:

This Policy does not apply to plants.

Review Analysis:

Please refer to the final critical habitat designation for *Xylosma crenatum* published in the Federal Register on February 27, 2003 (USFWS 2003) for a complete review of the species' status (including biology and habitat), threats, and management efforts. No new threats and 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 *X. crenatum*.

Xylosma crenatum, a long-lived perennial tree, has long been a poorly understood, rare endemic Hawaiian species. The first recorded collection was made by Charles Forbes in Kauai's Waimea drainage basin in 1917, but was long misidentified as a species of *Hibiscus*. In 1968, Robert Hobdy again collected a specimen, from the bank of Mohihi Stream, which was described as a new species in 1972 (St. John 1972), but mistakenly classified in the wrong family and genus (*Antidesma crenatum*, family Euphorbiaceae), rather than in the genus *Xylosma* of the family Salicaceae (USFWS 1995). At the time it was federally listed as endangered, it had been reported from two sites: along upper Nualolo Trail in Kuia Natural Area Reserve and along Mohihi Road between Waiakoali and Mohihi drainages in the Na Pali-Kona Forest Reserve. Only a single female individual remained; however, at the Mohihi site scattered trees have since been located. In 1993, three populations with a total of 16 individuals were reported on State-owned land in Kainamanu, Nualolo Trail, and Mohihi Valley within Kokee State Park, Kuia Natural Area Reserve, and Na Pali-Kona Forest Reserve, respectively. In 2000 and again in 2006, 20 individuals were reported in four populations (USFWS 2008; Perlman 2006).

Little is known about the life history of *Xylosma crenatum*. Flowering cycles, pollination vectors, seed dispersal agents, longevity, specific environmental requirements, and limiting factors are unknown (USFWS 1995). Observation from herbarium vouchers at Bernice P. Bishop Museum and the National Tropical Botanical Garden were often collected in sterile condition, indicating that it may flower infrequently or have short flowering and fruiting periods. The species has dioecious flowers (with male and female flowers on separate plants). Male trees were noted to be flowering in May and August, and other specimens displayed fruiting in January, August, October, and November (Hawaii Biodiversity and Mapping Program 2007; National Tropical Botanical Garden 2008a; C. Imada, Bernice P. Bishop Museum, pers. comm. 2008).

A planted tree of *Xylosma crenatum* grown at National Tropical Botanical Garden from seed acquired at Nualolo exhibited lack of lower leaf surface pubescence, a key character distinguishing it from the more common *X. hawaiiense*. The specimen introduces the possibility that *X. crenatum* may not be worthy of specific separation from *X. hawaiiense*. More taxonomic research needs to be done (National Tropical Botanical Garden 2008a; K. Wood, National Tropical Botanical Garden, pers. comm. 2008).

The main threats to *Xylosma crenatum* remain competition from introduced invasive plant species (Factor E), the small number of individuals and scattered distribution which make this species vulnerable to human or natural environmental disturbance (Factor E), and habitat degradation by feral pigs (*Sus scrofa*) (Factors A and D). Introduced invasive plant species that threaten this species include *Psidium cattleianum* (strawberry guava), *P. guajava* (guava), *Rubus argutus* (Florida prickly blackberry), *Passiflora tarminiana* (banana poka), *Erigeron karvinskianus* (daisy fleabane), *Kalanchoe pinnata* (airplant), *Hedychium gardnerianum* (kahili ginger), and unidentified species of conifers (Factor E) (USFWS 1992, 1995, 2003; Hawaii Biodiversity and Mapping Program 2007). One plant was destroyed during road maintenance in 1993 (Factor B) (USFWS 1995). Additional threats identified for this species include predation by introduced rats (*Rattus* spp.) (Factor C), habitat modification by introduced mule deer (*Odocoileus hemionus*) (Factors A and D) (USFWS 2008), and insect larvae infestation on the seeds, rendering them non-viable (Factor C) (Lilleeng-Rosenberger 2005).

In addition to all of the other threats, species such as *Xylosma crenatum* that are endemic to small portions of a single island are inherently more vulnerable to extinction than widespread species because of the higher risks posed to a few populations and individuals by random demographic fluctuations and localized catastrophes such as hurricanes, landslides, flooding and disease outbreaks (Factor E). When considered on their own, the natural processes associated with being a single island endemic do not affect *X. crenatum* to such a degree that it is threatened or endangered with extinction in the foreseeable future, but these natural processes can exacerbate the threat from anthropogenic factors, such as habitat loss for human development or predation by introduced species (Factor E) (USFWS 1995).

To safeguard existing genetic material, propagation for genetic storage and reintroduction was occurring at the National Tropical Botanical Garden but all seeds lost viability (National Tropical Botanical Garden 2008b). A single plant, representing a wild individual from Nualolo, has been outplanted at National Tropical Botanical Garden (2007) in Limahuli gardens for genetic storage. *Xylosma crenatum* has been successfully air-layered (propagation method causing roots to grow on the stem of a branch to allow cuttings) in the wild (Lilleeng-Rosenberger 2005). The population in Kuia Natural Area Reserve and on Nualolo Trail have been spot-fenced (USFWS 1995; M. Bruegmann, USFWS, pers. comm. 2008).

Stabilizing, downlisting, and delisting objectives are provided in the recovery plan for plants from the island of Kauai (USFWS 1995), based on whether the species is an annual, a short-lived perennial (fewer than ten years), or a long-lived perennial. *Xylosma crenatum* is a long-lived perennial, and to be considered stabilized, which is the first step in recovering the species, the taxon must be managed to control threats (*e.g*., fenced) and be represented in an *ex situ* (off-site) collection. In addition, a minimum of three populations should be documented on the island of Kauai. Each of these populations must be naturally reproducing and increasing in number, with a minimum of 25 mature individuals per population.

The stabilization goals for this species have not been met as there are only 20 individuals and most of the threats have not been managed (see Table 1). Therefore, *Xylosma crenatum* meets the definition of endangered as it remains in danger of extinction throughout its range.

Recommendations for Future Actions:

- Continue collection of genetic resources for storage, future propagation and reintroducing into protected suitable habitat within historical range.

- Enhance current natural populations and establish new populations to increase numbers of individuals.

- Construct exclosure fences to protect all remaining individuals from the negative impacts of feral pigs and deer, and eradicate introduced invasive plant species within the exclosures.

- Work with Hawaii Division of Forestry and Wildlife and Hawaii State Parks to initiate planning and contribute to implementation of ecosystem-level restoration and management to benefit this species in the mesic forests of western Kauai.

- Survey geographical and historical range for a thorough current assessment of the species.

- Assess genetic variability of extant populations.

- Study *Xylosma crenatum* populations with regard to population size and structure, geographical distribution, flowering cycles, pollination vectors, seed dispersal agents, longevity, specific environmental requirements, limiting factors, and threats.

References:

Hawaii Biodiversity and Mapping Program. 2007. Program Database. University of Hawaii, Center for Conservation, Research and Training. Unpublished.

Lilleeng-Rosenberger, K.E. 2005. Growing Hawaii's native plants. Mutual Publishing, Honolulu, HI. 416 pages.

National Tropical Botanical Garden. 2007. Report on controlled propagation of listed and candidate species, as designated under the U.S. Endangered Species Act. Unpublished.

National Tropical Botanical Garden. 2008a. Herbarium database; National Tropical Botanical Garden, Kalaheo, Hawaii. Available online at <http://ntbg.org/herbarium>. Accessed 10 March 2008.

National Tropical Botanical Garden. 2008b. Report on controlled propagation of listed and candidate species, as designated under the U.S. Endangered Species Act. Unpublished.

Perlman, S. 2006. Plant Extinction Prevention status of Kauai species. August 28, 2006. Unpublished.

St. John, H. 1972. Plantae Hobdyanae Kauaienses. Hawaiian plant studies 31. Pacific Science 26:275-295.

[USFWS] U.S. Fish and Wildlife Service. 1992. Endangered and threatened wildlife and plants; determination of endangered status for six plants from the Kokee region, island of Kauai, Hawaii; final rule. Federal Register 57(93):20580-20589.

[USFWS] U. S. Fish and Wildlife Service. 1995. Recovery plan for the Kauai plant cluster. U. S. Fish and Wildlife Service, Portland, OR. 270 pages.

[USFWS] U.S. Fish and Wildlife Service. 2003. Endangered and threatened wildlife and plants; final designation or nondesignation of critical habitat for 95 plant species from the islands of Kauai and Niihau, HI; final rule. Federal Register 68(39):9116-9479.

[USFWS] U.S. Fish and Wildlife Service. 2008. Rare plant tracking database. Pacific Islands Fish and Wildlife Office, Honolulu, HI. Accessed on April 28, 2008. Unpublished.

Personal Communications:

Bruegmann, Marie. 2008. Plant Recovery Coordinator, USFWS. Personal communication, June 12, 2008.

Imada, Clyde. 2008. Research Specialist, Department of Natural Science/Botany, Bernice P. Bernice P. Bishop Museum, e-mail communication to C. Torres-Santana (USFWS) on June 30, 2008.

Wood, Ken. 2008. Research Biologist, National Tropical Botanical Garden. Personal communication to Bernice P. Bishop Museum on June 2008.

Table 1. Status of *Xylosma crenatum* from listing through 5-year review.

Date	No. wild individuals	No. outplanted	Stability Criteria identified in Recovery Plan	Stability Criteria Completed?
1992 – listing	1	0	All threats managed in all 3 populations	No
			Complete genetic storage	No
			3 populations with 25 mature individuals each	No
1995 – recovery plan	13	0	All threats managed in all 3 populations	No
			Complete genetic storage	Partially
			3 populations with 25 mature individuals each	No
2003 – critical habitat	16	0	All threats managed in all 3 populations	Partially
			Complete genetic storage	Partially
			3 populations with 25 mature individuals each	No
2008 – 5-yr review	20	0	All threats managed	Partially
			Complete genetic storage	Partially
			3 populations with 25 mature individuals each	No

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SIGNATURE PAGE for 5-YEAR REVIEW of *Xylosma crenatum*

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

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Date 6/2/09