

5-YEAR REVIEW

Short Form Summary

Species Reviewed: *Cyperus trachysanthos* (puukaa)

Current Classification: Endangered

Federal Register Notice announcing initiation of this review:

[USFWS] U.S. Fish and Wildlife Service. 2008. Endangered and threatened wildlife and plants; initiation of 5-year status reviews of 70 species in Idaho, Montana, Oregon, Washington, and the Pacific Islands. Federal Register 73(83):23264-23266.

Lead Region/Field Office:

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

Name of Reviewer(s):

Marie Bruegmann, Pacific Islands Fish and Wildlife Office, Plant Recovery Coordinator
Marilet A. Zablan, Pacific Islands Fish and Wildlife Office, Assistant Field Supervisor for Endangered Species
Jeff Newman, Pacific Islands Fish and Wildlife Office, Acting Deputy Field Supervisor

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 April 29, 2008. The review was based on the final critical habitat designations for *Cyperus trachysanthos* and other species from the islands of Kauai and Oahu (USFWS 2003a, b), as well as a review of current, available information. The National Tropical Botanical Garden provided an initial draft of portions of the review and recommendations for conservation actions needed prior to the next five-year review. The evaluation of Tamara Sherrill, biological consultant, was reviewed by the Plant Recovery Coordinator. The document was then reviewed by the Assistant Field Supervisor for Endangered Species and Acting Deputy Field Supervisor 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 designations for *Cyperus trachysanthos* published in the Federal Register on February 27, 2003 and June 17, 2003 (USFWS 2003a, b) 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 *C. trachysanthos*.

This is a perennial herb once known from Lanai, Molokai, Kauai, and Niihau. *Cyperus trachysanthos* is extinct on Lanai and Molokai where it once grew (USFWS 2003a). At the time of listing, there were three known populations on Niihau, Kauai, and Oahu with an estimated total of 350 individuals (USFWS 1996). There are currently seven populations on Kauai and Oahu with a total of at least 700 individuals.

In 2003, there was one known population with about 300 individuals on the island of Kauai, in Nualolo Valley on State-owned land, and one west of Mokouia Valley on the privately owned island of Niihau with an unknown number of individuals (USFWS 2003a). Wagner considered *Cyperus trachysanthos* also extinct on Niihau (Wagner and Herbst 2009), and no new information to the contrary is known. It has been suggested that it once grew on the islet of Lehua, off Niihau, and that it could be restored there (Wood *et al.* 2004). From 2001 to 2002, approximately 200 to 230 individuals of *Cyperus trachysanthos* were seen at Nualolo Aina, east of the stream mouth at 61 to 85 meters (200 to 280 feet) elevation, in a seep with *Hibiscus tiliaceus* (National Tropical Botanical Garden 2009a; Wood 2009).

On Oahu, *Cyperus trachysanthos* was known from Kaena Point Natural Area Reserve, nearby Manini Gulch, Diamond Head, Makapuu, Queens Beach, and the Kawainui Marsh area, on Federal, State, and private lands. There were six populations with a total of 40 individuals reported on Oahu in 2003 (USFWS 2003b). On Oahu there are now believed to still be up to six populations: Maunawili in the Koolau Mountains (USFWS 2008), Diamond Head (Fort Ruger) (Rubinoff *et al.* 2005), Kaena Point (Hawaii Division of Forestry and Wildlife 2007), the U.S. Army's Dillingham Military Reservation, Manini Gulch, and U.S. Navy's Lualualei Antennae Field (USFWS 2008). The numbers of individuals at Kaena Point, Maunawili, and Manini Gulch are not currently known. At Diamond Head State Park there were 40 individuals of *C. trachysanthos* in 2003 (USFWS 2003b). At Kealakupapa, in the Koko Head area, one individual of *C. trachysanthos* was recorded at 6 meters (20 feet) elevation in 2005 (Hawaii Biodiversity and Mapping Program 2009). At the Lualualei radio transmitting facility, in the Schofield Barracks area, approximately 350 mature individuals of *Cyperus trachysanthos* were seen at 23 meters (75 feet) elevation in 2004 (Hawaii Biodiversity and Mapping Program 2009).

There are seven populations known state-wide, and as many as one thousand individuals might be found if surveys were conducted again in known locations (based on the numbers previously reported above). Numbers do fluctuate widely with rainfall, with the largest numbers seen at most locations in wetter years (F. Kraus, Bernice Pauahi Bishop Museum, pers. comm. 2009; C. Imada, Bernice Pauahi Bishop Museum, pers. comm. 2009).

There is no new information regarding genetics, genetic variation, taxonomic classification, or changes in nomenclature.

Cyperus trachysanthos is usually found in wet sites (mud flats, wet clay soil, or wet cliff seeps) on flats or talus slopes at elevations between 0 and 235 meters (0 and 771 feet). *Hibiscus tiliaceus* (hau) is often found in association with this species (USFWS 2003a). *Hibiscus tiliaceus* and invasive introduced species form secondary succession vegetation which dominates in the headland slopes above the sea where *C. trachysanthos* occurs on Kauai (Wood 2009). At Kealakipapa on Oahu, *C. trachysanthos* is seen with the endangered plant *Marsilea villosa* (ihi ihi) (Hawaii Biodiversity and Mapping Program 2009).

Threats to this species on Kauai are the loss of wetlands (Factor A) and a risk of extinction from naturally occurring events, such as landslides or hurricanes, due to the small number of individuals (Factor E) (USFWS 2003a). Invasive introduced plant species which are competing with *Cyperus trachysanthos* and dominate its habitat are *Ageratum conyzoides* (billy goat weed), *Anagallis arvensis* (scarlet pimpernel), *Chloris virgata* (feather finger grass), *Lantana camara* (lantana), and *Plantago lanceolata* (English plantain). Goats (*Capra hircus*) are numerous in Nualolo (Factor E) (Wood 2009).

The threats to *Cyperus trachysanthos* on Oahu are competition with invasive introduced plant species (Factor E); habitat degradation by feral goats (Factor A); fire (Factor E); habitat disturbance by off-road vehicles (Factor E); pumping of wetlands for flood and mosquito control (Factor A); modifications to the wetland topography (Factor A); mowing (Factor E); herbicide application (Factor E); and run-off from nearby Hawaii Army National Guard activities at Diamond Head, such as the cleaning of vehicles, dumping of paints or thinners, or the use of pesticides (Factor E) (USFWS 2003b).

Climate change may also pose a threat to *Cyperus trachysanthos* (Factors A and E). However, current climate change models do not allow us to predict specifically what those effects, and their extent, would be for this species.

There is no new information regarding overutilization for commercial, recreational, scientific, or educational purposes (Factor B), no new disease or predation reported for this species (Factor C), and no new information regarding the inadequacy of existing regulatory mechanisms (Factor D).

In 2003, 95 hectares (237 acres) of State land was designated as critical habitat for *Cyperus trachysanthos* on Oahu at Kaena Point, Nonoula Crater, Ihihelauakea Crater and Diamond Head State Park. Only one of these locations is currently occupied by *C. trachysanthos*, but all could be used for reintroductions in the future as all are considered to be within the species' historical range (USFWS 2003b). Since 2006, the National Tropical Botanical Garden on Kauai has grown 207 *C. trachysanthos* individuals for outplanting for genetic storage in stream restoration projects in the McBryde and Allerton Gardens in Lawai Valley, and in Limahuli Garden on Kauai. They have survived in the Lawai Kai restoration. They have also been outplanted for genetic storage at Makauwahi Cave Reserve. The Hawaii Division of Forestry and Wildlife took several individuals of

C. trachysanthos for outplanting in their Kawaiele enclosure in 2007 (National Tropical Botanical Garden 2006, 2008). The Center for Conservation Research and Training has 41,258 seeds from several populations in storage at their Seed Storage Facility on Oahu (Center for Conservation Research and Training Seed Storage Facility 2008), and seed from the Kauai population is in the seed bank at the National Tropical Botanical Garden (National Tropical Botanical Garden 2009b). Seed from the Lualualei population is also in storage at the Oahu Division of Forestry and Wildlife Nursery at Dillingham, Oahu, and ten individual plants have been reintroduced to Pouhala Marsh (Hawaii Division of Forestry and Wildlife 2009). Waimea Valley Arboretum has five individuals in their nursery representing one wild individual from an Oahu population (Waimea Valley Arboretum 2009).

Stabilizing, downlisting, and delisting objectives are provided in the recovery plan for multi-island plants (USFWS 1999), based on whether the species is an annual, a short-lived perennial (fewer than 10 years), or a long-lived perennial. *Cyperus trachysanthos* is a short-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 islands of Oahu, Kauai, or islands where they occurred historically. Each of these populations must be naturally reproducing and increasing in number, with a minimum of 50 mature individuals per population.

The interim stabilization goals for this species have not been met (see Table 1), as only two populations contain more than 50 mature individuals and not all threats are being addressed in all populations. Therefore, *Cyperus trachysanthos* meets the definition of endangered as it remains in danger of extinction throughout its range.

Recommendations for Future Actions:

- Survey Oahu populations to ascertain current numbers of individuals and whether populations are naturally reproducing and increasing in number.
- Continue collecting material for genetic storage and propagation for reintroduction, especially from Oahu populations underrepresented in seed storage (all but Lualualei).
- Continue propagation and outplanting into suitable protected habitat.
- Work with Hawaii Division of Forestry and Wildlife and other land managers or land owners to initiate planning and contribute to implementation of ecosystem-level restoration and management to benefit this species.

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- Hawaii Division of Forestry and Wildlife, Department of Land and Natural Resources. 2007. Final environmental assessment, Kaena Point ecosystem restoration project; Waianae and Waialua districts, island of Oahu, Honolulu, Hawaii. 433 pages.
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- [USFWS] U.S. Fish and Wildlife Service. 1996. Endangered and threatened wildlife and plants; determination of endangered or threatened status for fourteen plant taxa from the Hawaiian Islands; final rule. Federal Register 61(198):53108-53124.
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Personal Communications:

Imada, Clyde. 2009. Botanist, Bernice Pauahi Bishop Museum, Honolulu, Hawaii. E-mail to Marie Bruegmann, U.S. Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office, dated August 13, 2009.

Kraus, Fred. 2009. Herpetologist, Bernice Pauahi Bishop Museum, Honolulu, Hawaii. E-mail to Marie Bruegmann, U.S. Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office, dated August 10, 2009.

Table 1. Status of *Cyperus trachysanthos* from listing through 5-year review.

Date	No. wild indivs.	No. outplanted	Stability Criteria identified in Recovery Plan	Stability Criteria Completed?
1996 (listing)	350	0	All threats managed in all 3 populations	No
			Complete genetic storage	No
			3 populations with 50 mature individuals each	No
1999 (recovery plan)	517	0	All threats managed in all 3 populations	Partially
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	No
2003 (critical habitat)	340	0	All threats managed in all 3 populations	Unknown
			Complete genetic storage	Unknown
			3 populations with 50 mature individuals each	No
2009 (5-year review)	691	several	All threats managed	Partially
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	Partially

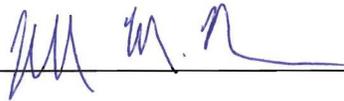
U.S. FISH AND WILDLIFE SERVICE
SIGNATURE PAGE for 5-YEAR REVIEW of *Cyperus trachysanthos* (puukaa)

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

ps Field Supervisor, Pacific Islands Fish and Wildlife Office



Date **AUG 27 2010**