

## 5-YEAR REVIEW

### Short Form Summary

**Species Reviewed:** *Cenchrus agrimonioides* (kamanomano)

**Current Classification:** Endangered

**Federal Register Notice announcing initiation of this review:**

USFWS] U.S. Fish and Wildlife Service. 2012. Endangered and threatened wildlife and plants; 5-year status reviews of 46 species in Idaho, Oregon, Washington, Nevada, Montana, Hawaii, Guam, and the Northern Mariana Islands. Federal Register 77(44):13248-13251

**Lead Region/Field Office:**

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

**Name of Reviewer(s):**

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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 6, 2012. The review was based on a review of current, available information since the last 5-year review for *Cenchrus agrimonioides* (kamanomano) (USFWS 2009). The evaluation by Ann Marie Gawel and Chelsie Javar-Salas, both Plant Biologists, were reviewed by the Island Team Manager, and Plant Recovery Coordinator, followed by the Recovery Program Lead. 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 ([http://ecos.fws.gov/tess\\_public](http://ecos.fws.gov/tess_public)).

**Review Analysis:**

Please refer to the previous 5-year review for *Cenchrus agrimonioides* published on July 21, 2009 (available at [http://ecos.fws.gov/docs/five\\_year\\_review/doc2455.pdf](http://ecos.fws.gov/docs/five_year_review/doc2455.pdf)) for a complete review of the species' status, threats, and management efforts. 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. agrimonioides*.

This short-lived perennial grass is endangered and has two recognized varieties: *Cenchrus agrimonioides* var. *agrimonioides*, found on the islands of Oahu, Lanai, and Maui, and *C. agrimonioides* var. *laysanensis*, known historically from the Northwestern

Hawaiian Islands of Laysan, Kure, and Midway (USFWS 1999). Populations of *C. agrimonioides* var. *agrimonioides* on Lanai are no longer extant (USFWS 2003a), as reported in the last 5-year review (USFWS 2009). Populations of *C. agrimonioides* var. *laysanensis* were last collected in 1973 on Kure Atoll, Midway Atoll, and Laysan (Wagner *et al.* 1999; USFWS 2003b). The current status and trends for *Cenchrus agrimonioides* and its varieties are provided in the tables below.

New status information:

In addition to those populations cited in the previous 5-year review, new observations include the following:

- In 2012, the Oahu Army Natural Resource Program reported a combined total of 403 individuals of *Cenchrus agrimonioides* var. *agrimonioides* in the Kahanahaiki to Pahole population, 229 individuals in the Central Ekahanui population, and 13 individuals within the Makaha and Waianae Kai population (U.S. Army Garrison 2012).

Overall, *Cenchrus agrimonioides* var. *agrimonioides* has increased from approximately 148 wild mature individuals reported in the last 5-year review to 645 wild mature individuals for the current 5-year review (U.S. Army Garrison 2012).

New threats:

- Climate change destruction or degradation of habitat – Climate change may pose a threat to this species. 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 *Cenchrus agrimonioides* is moderately vulnerable to the impacts of climate change. Therefore, additional management actions are needed to conserve this taxon into the future.

New management actions:

- Ungulate monitoring and control
  - The Central Ekahanui population containing *C. agrimonioides* var. *agrimonioides* is fenced and ungulate free as of 2012 (U.S. Army Garrison 2012). Control of ungulates has been partially achieved in the Kahanahaiki to Pahole and Makaha and Waianae Kai population through fence construction (U.S. Army Garrison 2012).
  - Individuals located at Ulupalakua Ranch and Kanaio Natural Area Reserves are fenced (Plant Extinction Prevention Program [PEPP] 2012).
- Invasive plant monitoring and control
  - Weed control is ongoing at Central Ekahanui, Kahanahaiki, Makaha, and Waianae Kai populations around rare species populations by staff of the Oahu Army Natural Resource Program (U.S. Army Garrison 2010, 2011, 2012).
  - The Plant Extinction Prevention Program reported that manual weed control was occurring at the Ulupalakua Ranch and Kanaio Natural Area Reserve fenced locations on Maui (PEPP 2012).

- Captive propagation for genetic storage and reintroduction
  - The Oahu Army Natural Resource Program (2012a) has 773 seeds remaining in storage after propagating 16 new seeds in 2012.
  - There were 492 individuals of *C. agrimonioides* var. *agrimonioides* in propagation at the U.S Army Nursery (Oahu Army Natural Resource Program 2012b).
  - The National Tropical Botanical Garden (2013) has approximately 370 seeds in storage collected from Oahu.
  - Maui Nui Botanical Gardens (2013) has two individuals of *C. agrimonioides* var. *agrimonioides* representing wild individuals known from Kanaio Natural Area Reserve and two individuals at their nursery collected from West Maui.
  - Sixty individuals of *C. agrimonioides* var. *agrimonioides* were outplanted by Kahoolawe Island Reserve Commission on Kahoolawe in 2011 (Maui Nui Botanical Gardens 2012).
  - Harold L. Lyon Arboretum Seed Conservation Laboratory (2013) has approximately 253 seeds of *C. agrimonioides* var. *agrimonioides* from Maui are in storage.
- Fire monitoring and control – Fuel-load reduction for fire prevention is ongoing within population units on U.S. Army properties (U.S. Army Garrison 2011).
- Population viability monitoring and analysis – The Oahu Army Natural Resource Program monitored all wild populations in 2010 and 2011 (U.S. Army Garrison 2010, 2011).
- Listing and critical habitat designation – Six units of unoccupied and occupied areas of critical habitat for *C. agrimonioides* var. *agrimonioides* was proposed in the lowland dry ecosystem on Maui and a single unit of unoccupied area on Lanai (USFWS 2012). The final rule for critical habitat designations has not been published at the time of this review.

**Synthesis:**

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. *Cenchrus agrimonioides* is a short-lived perennial, and to be considered stable, this species 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 islands where the species now occurs or 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, as currently no population of 50 mature individuals exists on other islands except Oahu (Table 1) and all threats are not being sufficiently managed throughout all of the populations (Table 2). Therefore, *Cenchrus agrimonioides* meets the definition of endangered as it remains in danger of extinction throughout its range.

### **Recommendations for Future Actions:**

- Captive propagation for genetic storage and reintroduction
  - Continue seed collection to obtain full genetic representation of *Cenchrus agrimonioides* for use in *ex situ* propagation.
  - Evaluate genetic resources currently in storage to determine the need to place additional genetic resources in long-term storage due to this species' vulnerability to climate change.
- Reintroduction/translocation – Continue reintroduction efforts in current and historical range.
- Invasive plant monitoring and control – Control invasive introduced plant species in the vicinity of all known populations of *Cenchrus agrimonioides* and maintain those areas free of invasive introduced plants.
- Surveys / inventories – Conduct surveys of all suitable habitats where *Cenchrus agrimonioides* was historically seen.
- Ungulate monitoring and control – Fence remaining populations to protect them from the impacts of feral ungulates.
- Human interaction monitoring and management – Develop and implement effective measures to reduce the impact of trampling from hikers.
- Stochastic events – Build resilience and redundancy – Increase numbers of populations and individuals scattered through historic range to reduce impacts from drought.
- Fire monitoring and control – Develop and implement fire management plans for all wild and reintroduced populations.
- 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 *Cenchrus agrimonioides* from listing through current 5-year review.**

<b>Date</b>	<b>No. wild indivs</b>	<b>No. outplanted</b>	<b>Stabilization Criteria identified in Recovery Plan</b>	<b>Stabilization Criteria Completed?</b>
1996 (listing)	>100	0	All threats managed in all 3 populations	No
			Complete genetic storage	No
			3 populations with 50 mature individuals each	No
1999 (recovery plan)	>100	0	All threats managed in all 3 populations	Partially
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	No
2003 (critical habitat)	~113-118	Unknown	All threats managed in all 3 populations	Partially
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	Unknown
2008 (5-year review)	185	312	All threats managed in all 3 populations	Partially
			Complete genetic storage	Partially

Date	No. wild indivs	No. outplanted	Stabilization Criteria identified in Recovery Plan	Stabilization Criteria Completed?
			3 populations with 50 mature individuals each	Partially
2012 (critical habitat – proposed)	<i>C. agrimonioides</i> var. <i>agrimonioides</i> 5 (Maui only)	Unknown	All threats managed in all 3 populations	Partially
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	Partially
2014 (5-yr review)	<i>C. agrimonioides</i> var. <i>agrimonioides</i> 645; <i>C. agrimonioides</i> var. <i>laysanensis</i> 0	<i>C. agrimonioides</i> var. <i>agrimonioides</i> 60; <i>C. agrimonioides</i> var. <i>laysanensis</i> 0	All threats managed in all 3 populations	Partially
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	Partially

**Table 2. Threats to *Cenchrus agrimonioides* and ongoing conservation efforts.**

<b>Threat</b>	<b>Listing factor</b>	<b>Current Status</b>	<b>Conservation/ Management Efforts</b>
Ungulates – degradation of habitat and herbivory	A, C, D, E	Ongoing	Partially, Central Ekahanui and some on Maui
Invasive introduced plants	A, E	Ongoing	Partially, ongoing on Oahu and Maui sites
Fire	E	Ongoing	Partially, ongoing on Oahu
Human disturbance – trampling by hikers	E	Ongoing	None
Drought	E	Ongoing	None
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.

Harold L. Lyon Arboretum Seed Conservation Laboratory. 2013. Seed storage database. University of Hawaii at Manoa, Honolulu, Hawaii. Unpublished.

Maui Nui Botanical Gardens. 2012. Report on controlled propagation of listed and candidate species, as designated under the U.S. Endangered Species Act. 30 pages. Unpublished.

Maui Nui Botanical Gardens. 2013. Report on controlled propagation of listed and candidate species, as designated under the U.S. Endangered Species Act. 12 pages. Unpublished.

National Tropical Botanical Garden. 2013. Report on controlled propagation of listed and candidate species, as designated under the U.S. Endangered Species Act. 78 pages. Unpublished.

Oahu Army Natural Resource Program. 2012a. Makua implementation plan, U.S. Army seed bank inventory summary. 154 pages. Unpublished.

Oahu Army Natural Resource Program. 2012b. Makua implementation plan, U.S. Army nursery inventory summary. 5 pages. Unpublished.

- [PEPP] Plant Extinction Prevention Program. 2012. Plant Extinction Prevention Program annual report, fiscal year 2012 (July 1, 2011-June 30, 2012). 169 pages. Unpublished.
- U.S. Army Garrison. 2010. Status report for the Makua and Oahu implementation plans. U.S. Army Garrison, Hawaii and Pacific Cooperative Park Studies Unit. Schofield Barracks, Hawaii. 588 pages. Available online at <[http://manoa.hawaii.edu/hpicesu/DPW/2010\\_YER/default.htm](http://manoa.hawaii.edu/hpicesu/DPW/2010_YER/default.htm)>.
- U.S. Army Garrison. 2011. Status report for the Makua and Oahu implementation plans. U.S. Army Garrison, Hawaii and Pacific Cooperative Park Studies Unit. Schofield Barracks, Hawaii. 269 pages. Available online at <[http://manoa.hawaii.edu/hpicesu/DPW/2011\\_YER/default.htm](http://manoa.hawaii.edu/hpicesu/DPW/2011_YER/default.htm)>.
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- [USFWS] U.S. Fish and Wildlife Service. 1999. Recovery plan for the multi-island plants. U.S. Fish and Wildlife Service, Portland, Oregon. 206 pages + appendices. Available online at <<http://www.fws.gov/pacificislands/recoveryplans.html>>.
- [USFWS] U.S. Fish and Wildlife Service. 2003a. Endangered and threatened wildlife and plants; final designation of critical habitat for three plant species from the island of Lanai, Hawaii; final rule. Federal Register 68(6):1220-1274.
- [USFWS] U.S. Fish and Wildlife Service. 2003b. Endangered and threatened wildlife and plants; designation of critical habitat for five plant species from the Northwestern Hawaiian Islands, Hawaii; final rule. Federal Register 68(99):28054-28075.
- [USFWS] U.S. Fish and Wildlife Service. 2009. *Cenchrus agrimonoides* (kamanomano) 5-year review summary and evaluation. U.S. Fish and Wildlife Service, Honolulu, Hawaii. 16 pages.
- [USFWS] U.S. Fish and Wildlife Service. 2012. Endangered and threatened wildlife and plants; listing 38 species on Molokai, Lanai, and Maui as endangered and designating critical habitat on Molokai, Lanai, Maui, and Kahoolawe for 135 species; proposed rule. Federal Register 77(112):34464-34775.
- Wagner, W.L., Brueggmann, M.M., Herbst, D.M., and Lau, C.Q.C. 1999. Hawaiian vascular plants at risk. Bishop Museum Occasional Papers 60:1-58.



**U.S. FISH AND WILDLIFE SERVICE**  
**SIGNATURE PAGE for 5-YEAR REVIEW of *Cenchrus agrimonioides***  
**(kamanomano)**

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

*for* **Programmatic Deputy Field Supervisor, Pacific Islands Fish and Wildlife Office**

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