5-YEAR REVIEW

Short Form Summary

Species Reviewed: *Centaurium sebaeoides* (awiwi)

Current Classification: Endangered

Federal Register Notice announcing initiation of this review:

[USFWS] U.S. Fish and Wildlife Service. 2010. Endangered and threatened wildlife and plants; initiation of 5-year status reviews of 58 species in Washington, Oregon, California, and Hawaii. Federal Register 75(226):71726-71729.

Lead Region/Field Office:

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

Name of Reviewer(s):

Vickie Caraway, Plant Biologist, PIFWO

Daniel Clark, Oahu, Kauai, Northwest Hawaiian and American Samoa Islands Team Manager, PIFWO

Marie Bruegmann, Plant Recovery Coordinator, PIFWO

Recovery Program Lead, 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 January 31, 2012. The review was based on a review of current, available information since the last five-year review for *Centaurium sebaeoides* (USFWS 2010). The National Tropical Botanical Garden provided an initial draft of portions of the five-year review and recommendations for conservation actions needed prior to the next five-year review. The document was reviewed by the Plant Biologist, Islands 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).

Review Analysis:

Please refer to the previous 5-year review for *Centaurium sebaeoides* published on August 27, 2010 (available at http://ecos.fws.gov/docs/five_year_review/doc3290.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 *C. sebaeoides.*

This determinate, day-length sensitive annual is endangered, occurring on the islands of Oahu, Molokai, Lanai, Maui, and Kauai. The current status and trends for *Centaurium sebaeoides* are provided in the tables below.

New taxonomic information:
The taxonomic treatment of the genus *Centaurium* discussed in the last five-year review, moving *Centaurium to Schenkia* (Mansion 2004), has been accepted by USFWS. In 2012, USFWS proposed revised the taxonomic status for this species when it revised critical habitat on Maui Nui, with no change in range or distribution (USFWS 2012). This species is now proposed for listing as *Schenkia sebaeoides*, and will be referred to as such for the remainder of this review.

New status information:

- Four populations are known on Molokai; two of these populations include 100 individuals or more (A. Bakutis, Plant Extinction Prevention Program [PEPP], pers. comm. 2011).
- Two populations are known on Oahu. At Halona Gulch near the blowhole over 284 individuals were reported in 2011, increasing from the 40 to 50 mature individuals reported in 2009 (S. Ching, PEPP, pers. comm. 2011; USFWS 2010). This site has been monitored for several years by botanists Matt Keir and Joel Lau; however, no plants were observed from 2005 to 2010. The second Oahu population at Kaena Point includes two groups of plants, one with 150 individuals and 12 in the other (S. Ching, pers. comm. 2011).
- The size of *Schenkia sebaeoides* populations fluctuates radically on Maui as elsewhere, depending on rainfall. In some years there are thousands of individuals, and in other years none can be found. In addition to locations noted in the previous five-year review, a population was located on West Maui at Hawea Point. *Schenkia sebaeoides* was also observed in the late 1990s near Nakalele, with about 100+ plants observed, which was not reported in the last five-year review (Hank Oppenheimer, PEPP, pers. comm. 2011).

Overall, the species status is unclear since the last five-year review, as some populations have increased and some have decreased, but most have not been resurveyed.

New threats:

- Rodent predation or herbivory – Rats are a newly described threat to this species at the Halona Gulch area (S. Ching, pers. comm. 2011).
- Drought – Drought is another threat not previously mentioned for this species, as reported at Halona Gulch and Kaena Point (S. Ching, pers. comm. 2011).
- Fire - In July 2009, a fire in the Manini/Alau vicinity of Kaena Point burned designated critical habitat for *Schenkia sebaeoides* (U.S. Army Garrison 2009). Fire was not previously reported as a threat at this location.

New management actions:

- Captive propagation for genetic storage and reintroduction

    - Maui Nui Botanical Garden (MNBG)contains 15 plants in the nursery and 2,000 seeds in storage (MNBG 2011).
    - The Harold L. Lyon Arboretum recorded 31,100 *Schenkia sebaeoides* seeds in storage; and no individuals represented in micropropagation (Harold L. Lyon Arboretum 2012).
    - Oahu PEPP has been monitoring Oahu sites, making seed collections from Halona Gulch (PEPP 2012).
- Reintroduction / translocation – The Hawaii Division of Forestry and Wildlife proposed to introduce this species onto offshore islets (S. Ching, pers. comm. 2011).
- Ungulate exclosures – The Kaena Point population is within a predator-proof fence and within a weed control area (S. Ching, pers. comm. 2011).

Synthesis:
Stabilizing, downlisting, and delisting objectives are provided in the recovery plan for the 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.

Schenkia sebaeoides is an annual and to be considered stable, the threats to the taxon must be controlled and the taxon must 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 they now occur or occurred historically. Each of these populations must be mature, reproducing, and increasing in number, with a minimum of 100 mature individuals per population.

For the taxon to be downlisted from endangered to threatened status, a total of five to seven populations should be documented on islands where it now occurs or has occurred historically. Each of these populations must be naturally reproducing and increasing in number, with a minimum of 500 mature individuals per population. Each population should persist at this level for a minimum of 5 consecutive years before downlisting is considered.

The interim stabilization goals for this species have been met, at least in terms of numbers of individuals and populations, as Molokai and Oahu each have two populations with over 100 individuals. The downlisting goals for this species have not been met (see Table 1). Due to the ephemeral nature of some populations and the observed fluctuations of individual numbers from year to year, it is unknown whether there are five populations with at least 500 individuals that have persisted for five consecutive years. In addition, all threats are not being sufficiently managed (Table 2). Therefore, *Schenkia sebaeoides* meets the definition of endangered as it remains in danger of extinction throughout its range.

Recommendations for Future Actions:
- Ungulate exclosures - Construct exclosures and remove ungulates in wild populations.
- Ecosystem-altering invasive plant species control - Control invasive introduced plant species in wild populations.

- Fire protection - Develop and implement fire management plans for populations at risk of fire.
- Survey/inventories - Monitor populations which are fluctuating or ephemeral based on rainfall, since the former presence of the species at a given location would indicate that a seed bank might be present.
- Captive propagation for genetic storage and reintroduction - Collect material for genetic storage and propagation for reintroduction.
- 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 *Schenkia sebaeoides* from listing through current 5-year review.

Date	No. wild individuals	No. outplanted	Downlisting Criteria identified in Recovery Plan	Downlisting Criteria Completed?
1991 (listing)	>1,000	0	All threats managed in all 5-7 populations	No
			Complete genetic storage	No
			5-7 populations with 500 mature individuals each	No
1999 (recovery plan)	>580-2,250	0	All threats managed in all 5-7 populations	No
			Complete genetic storage	No
			5-7 populations with 500 mature individuals each	No
2003 (critical habitat)	212-thousands	0	All threats managed in all 5-7 populations	No
			Complete genetic storage	No
			5-7 populations with 500 mature individuals each	No
2010 (5-yr review)	6,000	0	All threats managed in all 5-7 populations	No
			Complete genetic storage	Partially
			5-7 populations with 300 mature individuals each	No
2013 (5-yr review)	Unknown	0	All threats managed in all 5-7 populations	Partially (Table 2)
			Complete genetic storage	Partially
			5-7 populations with 500 mature individuals each	Partially, number of populations and individuals unknown

Table 2. Threats to *Schenkia sebaeoides* and ongoing conservation efforts.

Threat	Listing factor	Current Status	Conservation/ Management Efforts
Ungulates – trampling, overgrazing and erosion of habitat by goats and cattle	A, E	Ongoing	Partially
Damage caused by off-road vehicles (Oahu, Molokai)	A	Ongoing	Partially
Fire (Oahu, Kauai)	A, E	Ongoing	None
Low numbers of individuals	E	Ongoing	None
Drought	A, E	Ongoing	None
Trampling by humans on or near trails (Oahu, Kauai)	E	Ongoing	None
Ecosystem-altering invasive species (all islands)	A, E	Ongoing	Partially - at Moomomi
Climate change	A, E	Increasing	None

References:

See previous 5-year review for a full list of references (USFWS 2007). Only references for new information are provided below.

Harold L. Lyon Arboretum. 2012. Micropropagation database and seed storage inventory. University of Hawaii at Manoa, Honolulu, Hawaii. Unpublished.

Mansion, G. 2004. A new classification of the polyphyletic genus *Centaurium* Hill (Chironiinae, Gentianaceae): description of the New World endemic *Zeltnera*, and reinstatement of *Gyrandra* Griseb. and *Schenkia* Griseb. Taxon 53(3):719-740.

[MNBG] Maui Nui Botanical Garden. 2011. Report on controlled propagation of listed and candidate species, as designated under the U.S. Endangered Species Act. 26 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. 2009. 2009 status report for the Makua and Oahu implementation plans. U.S. Army Garrison, Hawaii and Pacific Cooperative Park Studies Unit. Schofield Barracks, Hawaii. 711 pages. Available online at <http://manoa.hawaii.edu/hpicesu/dpw_mit.htm>. Accessed December 27, 2011.

[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.

[USFWS] U.S. Fish and Wildlife Service. 2007. *Centaurium sebaeoides* (awiwi) 5-year review summary and evaluation. U.S. Fish and Wildlife Service, Honolulu, Hawaii. 10 pages. Available online at <http://ecos.fws.gov/docs/five_year_review/doc3290.pdf >.

[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 designation of critical habitat on Molokai, Lanai, and Maui for 135 species; proposed rule. Federal Register 77:34464-34775.

Personal communications:

Bakutis, Ane. 2011. Molokai Coordinator, Plant Extinction Prevention Program. E-mail to Margaret Clark, National Tropical Botanical Garden, dated November 22, 2011. Subject: USFWS 5 yr reviews need "updata."

Ching, S. 2011. Oahu Coordinator, Plant Extinction Prevention Program. E-mail to Margaret Clark, National Tropical Botanical Garden, dated December 2, 2011. Subject: "right e-mail for Susan?"

Oppenheimer, Hank. 2011. Maui Nui Coordinator, Plant Extinction Prevention Program. E-mail to Margaret Clark, National Tropical Botanical Garden, dated December 28, 2011. Subject: *Ale_mac_mac.*

U.S. FISH AND WILDLIFE SERVICE
SIGNATURE PAGE for 5-YEAR REVIEW of *Centaurium sebaeoides* (awiwi)

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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Maine M Bulgman Date 2013-08-19