

Gahnia lanaiensis
(No common name)

**5-Year Review
Summary and Evaluation**

**U.S. Fish and Wildlife Service
Pacific Islands Fish and Wildlife Office
Honolulu, Hawaii**

5-YEAR REVIEW
Species reviewed: *Gahnia lanaiensis* (No common name)

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5-YEAR REVIEW
***Gahnia lanaiensis* (No common name)**

1.0 GENERAL INFORMATION

1.1 Reviewers

Lead Regional Office:

Region 1, Endangered Species Program, Division of Recovery, Jesse D'Elia,
(503) 231-2071

Lead Field Office:

Pacific Islands Fish and Wildlife Office, Loyal Mehrhoff, Field Supervisor, (808)
792-9400

Cooperating Field Office(s):

N/A

Cooperating Regional Office(s):

N/A

1.2 Methodology used to complete the 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 8, 2010. The review was based on final critical habitat designation for *Gahnia lanaiensis* and other species from the island of Lanai (USFWS 2003), as well as a review of current, available information. The Bernice Pauahi Bishop Museum 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 Samuel Aruch, biological consultant, was reviewed by a recovery biologist and the Plant Recovery Coordinator. The document was then reviewed by the Recovery Program Leader and the Assistant Field Supervisor for Endangered Species before submission to the Field Supervisor for approval.

1.3 Background:

1.3.1 Federal Register (FR) Notice citation announcing initiation of this review:

[USFWS] U.S. Fish and Wildlife Service. 2010. Endangered and threatened wildlife and plants; 5-year review status of 69 species in Idaho, Washington, Hawaii, Guam, and the Commonwealth of the Northern Mariana Islands. Federal Register 75(67):17947-17950.

1.3.2 Listing history

Original Listing

FR notice: U.S. Fish and Wildlife Service. 1991. Endangered and threatened wildlife and plants; determination of endangered status for six plants from the island of Lanai, Hawaii; final rule. Federal Register 56(183):47686-47695.

Date listed: September 20, 1991

Entity listed: Species

Classification: Endangered

Revised Listing, if applicable

FR notice: N/A

Date listed: N/A

Entity listed: N/A

Classification: N/A

1.3.3 Associated rulemakings:

USFWS. 2003. 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.

A proposed critical habitat designation for 5,861 hectares (14,482 acres) surrounding Lanaihale for 28 plant species, including *Gahnia lanaiensis*, was deferred because of a preexisting cooperative agreement between the USFWS and Castle and Cooke Resorts, LLC, to manage those lands, as well as adjacent lands, for the conservation benefit of the 28 listed plant species. Because large portions of the proposed critical habitat were already being managed under the Lanai Forest and Watershed Partnership by Castle and Cooke on a voluntary basis in cooperation with the USFWS and the State of Hawaii to achieve important conservation goals, and critical habitat designation threatened to reduce the landowner's cooperation, it was decided that the benefits of excluding the proposed area from critical habitat designation outweighed the costs (USFWS 2003).

USFWS. 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. Federal Register 77(112):34464-34775.

The USFWS published a proposed rule to delist *Gahnia lanaiensis*, due to new information that this species is synonymous with *G. lacera*, a widespread species from New Zealand (USFWS 2012). Because *G. lanaiensis* is not believed to be a uniquely valid species; is synonymous with *G. lacera*, a species endemic to New Zealand where it is known to be common; and is not in danger of extinction or likely to become an endangered species within the foreseeable future throughout

all or a significant portion of its range, the USFWS proposed to delist *G. lanaiensis* due to error in the original listing (USFWS 2012).

1.3.4 Review History:

Species status review [FY 2010 Recovery Data Call (August 2010)]:
Undetermined

Recovery achieved:

1 (0-25%) (FY 2007 Recovery Data Call)

1.3.5 Species' Recovery Priority Number at start of this 5-year review:

5

1.3.6 Current Recovery Plan or Outline

Name of plan or outline: USFWS. 1995. Lanai plant cluster recovery plan. U.S. Fish and Wildlife Service, Portland, Oregon. 138 pages.

Date issued: September 29, 1995

Dates of previous revisions, if applicable: N/A

2.0 REVIEW ANALYSIS

2.1 Application of the 1996 Distinct Population Segment (DPS) policy

2.1.1 Is the species under review a vertebrate?

Yes
 No

2.1.2 Is the species under review listed as a DPS?

Yes
 No

2.1.3 Was the DPS listed prior to 1996?

Yes
 No

2.1.3.1 Prior to this 5-year review, was the DPS classification reviewed to ensure it meets the 1996 policy standards?

Yes
 No

2.1.3.2 Does the DPS listing meet the discreteness and significance elements of the 1996 DPS policy?

Yes
 No

2.1.4 Is there relevant new information for this species regarding the application of the DPS policy?

Yes
 No

2.2 Recovery Criteria

2.2.1 Does the species have a final, approved recovery plan containing objective, measurable criteria?

Yes
 No

2.2.2 Adequacy of recovery criteria.

2.2.2.1 Do the recovery criteria reflect the best available and most up-to date information on the biology of the species and its habitat?

Yes
 No

2.2.2.2 Are all of the 5 listing factors that are relevant to the species addressed in the recovery criteria?

Yes
 No

2.2.3 List the recovery criteria as they appear in the recovery plan, and discuss how each criterion has or has not been met, citing information:

Stabilizing, downlisting, and delisting objectives are provided in the Lanai plant cluster recovery plan (USFWS 1995), based on whether the species is an annual, a short-lived perennial (fewer than 10 years), or a long-lived perennial. *Gahnia lanaiensis* is a short-lived perennial, and to be considered stabilized in the interim, which is the first step in recovering the species, the taxon must be managed to control threats (*e.g.*, fenced, weeding, etc.) and be represented in an *ex situ* (off-site) collection. In addition, a minimum of three populations should be documented on the island of Lanai. Each of these populations must be naturally reproducing and increasing in number, with a minimum of 50 mature individuals per population.

This recovery objective has not been met.

For downlisting, a total of five to seven populations of *Gahnia lanaiensis* should be documented on the island of Lanai. Each of these populations must be naturally reproducing, stable or increasing in number, and secure from threats, with a minimum of 300 mature individuals per population. Each population should persist at this level for a minimum of five consecutive years before downlisting is considered.

This recovery objective has not been met.

For delisting, a total of eight to ten populations of *Gahnia lanaiensis* should be documented on the island of Lanai. Each of these populations must be naturally reproducing, stable or increasing in number, and secure from threats, with 300 mature individuals per population for long-lived perennials. Each population should persist at this level for a minimum of five consecutive years before delisting is considered.

This recovery objective has not been met.

2.3 Updated Information and Current Species Status

2.3.1 Biology and Habitat

2.3.1.1 New information on the species' biology and life history:

The end of the flowering season for *Gahnia lanaiensis* has been described as July, and fruiting has been observed in October (Bishop Museum 2010). Pollination vectors, seed dispersal agents, longevity of plants and seeds, specific environmental requirements, and other limiting factors remain unknown (USFWS 2003).

2.3.1.2 Abundance, population trends (e.g. increasing, decreasing, stable), demographic features (e.g., age structure, sex ratio, family size, birth rate, age at mortality, mortality rate, etc.), or demographic trends:

Since the time of listing in 1991, *Gahnia lanaiensis* has been found to be a complete match for *G. lacera*, a species endemic to New Zealand (Koyama 2010) where it is known to be common (Piha New Zealand Plant Conservation Network 2010, in litt.)

In Hawaii at the time of listing in 1991, *Gahnia lanaiensis* was known from 15 or 16 large clumps growing along the summit of Lanaihale, extending for a distance of about 1.3 kilometers (0.8 miles) between 915 and 1,025 meters (3,000 and 3,360 feet) elevation and encompassing the entire known historical range of the species (USFWS 1991). Another apparently discrete population was reported in 1994 from the Awehi drainage south of Puhielelu, where 2 clumps containing 50 individuals per clump were noted (National Tropical Botanical Garden 2010 [*K.R. Wood* 3563]). In 1995, there were fewer than 50 large individuals within 4 populations located in wet forest in the same zone (USFWS 1995). Perlman and Wood (1997) noted populations at Hauola Gulch, along the Munro Trail, at the summit of Lanaihale, at the start of Hauola Trail, and the start of Haalelepaakai Trail.

In 2003, only a single population containing 47 individuals along the summit of Lanaihale in the Haalelepaakai area and on the eastern edge of Hauola Gulch was reported (USFWS 2003). In 2006, another single clump was discovered in the Kehewai Gulch headwaters (Oppenheimer 2007). The Plant Extinction Prevention Program (2008) reported discovering a single mature individual at East Hauola Trail (increasing the total to two individuals), with seed sent to Lyon Arboretum for storage. As of 2008, there are two populations consisting of fewer than 50 individuals of *Gahnia lanaiensis* (USFWS 2010).

2.3.1.3 Genetics, genetic variation, or trends in genetic variation (e.g., loss of genetic variation, genetic drift, inbreeding, etc.):

No new information.

2.3.1.4 Taxonomic classification or changes in nomenclature:

Gahnia lanaiensis is a short-lived perennial sedge first described as a Hawaiian endemic from Lanai in 1964. Degener and Degener (1965) mentioned its morphological affinity to *G. melanocarpa* of eastern Australia. However, the Hawaiian material differed in having very tall culms, larger spikes, less dense panicles, and dissimilar glume and nutlet characters. Degener and Degener retained a healthy skepticism about the nature of this newly described endemic sedge, though, noting that George Munro, a New Zealander who managed Lanai Ranch from 1911 to 1930 was an avid naturalist and conservationist. In addition, Munro had planted various New Zealand and Australian natives on Lanaihale in an effort to restore its watershed capabilities (Degener and Degener 1965; Koyama *et al.* 2010). The Degeners theorized that a sedge fruit could have inadvertently been introduced from either country.

The oldest collection at Bishop Museum of *Gahnia lanaiensis* was made by H. St. John in 1938 (predating its description by 26 years) from the summit cabin on Lanaihale. St. John notes on the label that the specimen was “apparently introduced” (Bishop Museum 2010 [*H. St. John 18866*]). Prominent botanists (Mann and Brigham, Hillebrand and Lydgate, Rock, and Forbes) had collected the native species *Gahnia beecheyi* and *G. gahniiformis* [= *Morelotia gahniiformis*] on Lanai in the late 1800s and early 1900s, but had not collected any material matching *G. lacera*, and it seemed unlikely that each botanist would have overlooked the species if it were present on Lanai during their time of visit (Koyama *et al.* 2010). Wagner *et al.* (1999) treated the species as an endemic, while noting the potential misidentification. Perlman and Wood (1997) noted that all individuals they found were either alongside roads, at trailheads, or at overlooks, suggesting they were planted. One specimen label from 1997 (Bishop Museum 2010 [*K.R. Wood 6000*]) notes that the specimen was

collected at Haalelepaakai along Munro Trail road, “one of several clumps known from this area; all populations are suspiciously located at trail heads or along roads where G. Munro was known to plant introduced exotics.”

To help resolve the identity problem with *Gahnia lanaiensis*, arrangements were made at Bishop Museum, Honolulu, to have sedge specialist Dr. T. Koyama examine genuine material of *Gahnia melanocarpa*, loaned from the National Herbarium at New South Wales in Sydney, Australia, for comparison with material of *G. lanaiensis* deposited at Bishop Museum. Koyama concluded that *G. lanaiensis* clearly differed from *G. melanocarpa* in details of the spikelets (small part of flower cluster) and achenes (a simple dry, indehiscent fruit with only one seed chamber) (Koyama *et al.* 2010). On the other hand, a close comparison between *G. lanaiensis* and Bishop Museum vouchers of *G. lacera* of New Zealand revealed a complete match in features of the spikelets, achenes, inner walls of the achene pericarp (fruit wall), and color of the leaf sheaths (dark purple-brown, in contrast to the light purplish brown leaf sheaths of *G. melanocarpa*). Koyama *et al.* (2010) concluded that the two species are one and the same (*G. lanaiensis* and *G. lacera*) and that *G. lacera* likely arrived on Lanai, intentionally or unintentionally, as a result of Munro’s environmental reforestation efforts. Thus, *G. lanaiensis* is no longer considered endemic to Lanai and is synonymous with the introduced, naturalized *G. lacera*, from New Zealand. The endangered status of this species will be evaluated and discussed in Section 2.4.

2.3.1.5 Spatial distribution, trends in spatial distribution (e.g. increasingly fragmented, increased numbers of corridors, etc.), or historic range (e.g. corrections to the historical range, change in distribution of the species’ within its historic range, etc.):

In Hawaii, this species is found along the Lanaihale summit trail on the island of Lanai (USFWS 1995, 2003) (see Section 2.3.1.2 above for more information).

2.3.1.6 Habitat or ecosystem conditions (e.g., amount, distribution, and suitability of the habitat or ecosystem):

The habitat of *Gahnia lanaiensis* ranges from montane to lowland wet or mesic *Metrosideros polymorpha* (ohia) – *Dicranopteris linearis* (uluhe) forest or shrubland between 914 and 1,030 meters (3,000 and 3,379 feet) elevation. It occurs on flat to gentle ridge crest topography in moist to wet clay or other soil substrate in open areas or in moderate shade (USFWS 1995, 2003; Hawaii Biodiversity and Mapping Program 2010). Associated native plant species include *Diplopterygium pinnatum* (uluhe lau nui), *Coprosma* sp. (pilo), *Scaevola chamissoniana* (naupaka), *Kadua*

affinis (manono), *Ilex anomala* (kawau), *Broussaisia arguta* (kanawao), *Leptocophylla tameiameiae* (pukiawe), *Freycinetia arborea* (ieie), *Lycopodiella cernua* (wawaeiole), *Sadleria* spp. (amau), *Doodia* sp. (okupukupu laulii), *Sphenomeris chinensis* (palaa) (USFWS 1995, 2003; Hawaii Biodiversity and Mapping Program 2010).

In more mesic habitats, such as at Awehi, associated native tree genera include *Pouteria* (alaa), *Xylosma* (maua), *Pisonia* (papala kepa), and *Charpentiera* (papala) (National Tropical Botanical Garden 2010).

2.3.1.7 Other:

No new information.

2.3.2 Five-Factor Analysis (threats, conservation measures, and regulatory mechanisms)

See section 2.4-Synthesis below.

2.4 Synthesis

Gahnia lanaiensis was listed as endangered in 1991 (USFWS 1991). At that time, this species was known from 15 or 16 large “clumped” plants growing on the summit of Lanaihale, on the island of Lanai. The distribution of these plants was considered to be the entire known range of the species. *Gahnia lanaiensis* was threatened due to the small number of individuals remaining and resulting negative consequences of very small populations which increased the potential for extinction of the species due to stochastic events; the potential for destruction of plants due their proximity to a popular hiking and jeep trail; and habitat degradation and destruction by feral ungulates and nonnative plants (USFWS 1991).

In a recently published paper, Koyama et al. (2010) found that based on spikelet and achene characters, *Gahnia lanaiensis* is a complete match for *G. lacera*, a species endemic to New Zealand. Koyama further states that *G. lacera* likely arrived on Lanai, either intentionally or unintentionally, through the restoration efforts of George Munro, the Resident Manager of Lanai Ranch from 1911 to 1930 (Koyama 2010). Born and raised in New Zealand, Munro is known to have used seeds of New Zealand's native plants for reforestation efforts on Lanai (Koyama 2010).

Because *Gahnia lanaiensis* is not believed to be a uniquely valid species; is synonymous with *G. lacera*, a species endemic to New Zealand where it is known to be common (Piha New Zealand Plant Conservation Network 2010, in litt.); and is not in danger of extinction or likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range, we support the propose rule (USFWS 2012) to delist *G. lanaiensis* due to error in the original listing.

Table 1. Status of *Gahnia lanaiensis* in Hawaii from listing through 5-year review.

Date	No. wild individuals	No. outplanted	Stabilization Criteria identified in Recovery Plan	Stabilization Criteria Completed?
1991 (Listing)	50	0	See below	
1995 (Recovery plan)	< 50	0	See below	
2003 (Critical habitat)	< 50	0	See below	
2012 (5-year review)	< 50	0	All threats managed in all 3 populations	No longer applicable
			Complete genetic storage	No longer applicable
			3 populations with 50 mature individuals each	No longer applicable

3.0 RESULTS

3.1 Recommended Classification:

Downlist to Threatened

Uplist to Endangered

Delist

Extinction

Recovery

Original data for classification in error

No change is needed

3.2 New Recovery Priority Number:

Brief Rationale:

3.3 Listing and Reclassification Priority Number:

Reclassification (from Threatened to Endangered) Priority Number: _____

Reclassification (from Endangered to Threatened) Priority Number: _____

Delisting (regardless of current classification) Priority Number: _____

Brief Rationale:

4.0 RECOMMENDATIONS FOR FUTURE ACTIONS

- Federal Register updates – Publish final rule delisting *Gahnia lanaiensis* due to error.

5.0 REFERENCES

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[USFWS] U.S. Fish and Wildlife Service. 2003. 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. 2010. Rare plant tracking database. Honolulu, Hawaii, Pacific Islands Fish and Wildlife Office. Unpublished.

USFWS. 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. Federal Register 77(112):34464-34775.

Wagner, W.L., D.R. Herbst, and S.H. Sohmer. 1999. Manual of the flowering plants of Hawaii, revised edition. University of Hawaii Press and Bishop Museum Press, Honolulu, Hawaii. Bishop Museum Special Publications 97. 1,919 pages.

Personal communications:

Oppenheimer, Hank. 2010. Maui Nui Coordinator, Plant Extinction Prevention Program, , Lahaina, Hawaii. E-mail to Clyde Imada, Bernice Pauahi Bishop Museum, dated October 13, 2010. Subject: *Viola lanaiensis*.

Signature Page
U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW of *Gahnia lanaiensis* (no common name)

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: _____

Review Conducted By:

Chelsie Javar, Fish and Wildlife Biologist
Marie Bruegmann, Plant Recovery Coordinator
Jess Newton, Endangered Species Recovery Program Leader
Kristi Young, Assistant Field Supervisor for Endangered Species

Field Supervisor, Pacific Islands Fish and Wildlife Office

for

 Jess Newton

Date 8/28/2012