U.S. FISH AND WILDLIFE SERVICE SPECIES ASSESSMENT AND LISTING PRIORITY ASSIGNMENT FORM

Scientific Name:

Pseudognaphalium (=gnaphalium) sandwicensium var. molokaiense

Common Name:

`Ena`ena

Lead region:

Region 1 (Pacific Region)

Information current as of:

06/19/2014

Status/Action

___ Funding provided for a proposed rule. Assessment not updated.

___ Species Assessment - determined species did not meet the definition of the endangered or threatened under the Act and, therefore, was not elevated to the Candidate status.

___ New Candidate

_X_ Continuing Candidate

___ Candidate Removal

> ___ Taxon is more abundant or widespread than previously believed or not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status
>
> ___ Taxon not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status due, in part or totally, to conservation efforts that remove or reduce the threats to the species
>
> ___ Range is no longer a U.S. territory
>
> ___ Insufficient information exists on biological vulnerability and threats to support listing
>
> ___ Taxon mistakenly included in past notice of review
>
> ___ Taxon does not meet the definition of "species"
>
> ___ Taxon believed to be extinct
>
> ___ Conservation efforts have removed or reduced threats

___ More abundant than believed, diminished threats, or threats eliminated.

Petition Information

___ Non-Petitioned

_X_ Petitioned - Date petition received: 05/11/2004

90-Day Positive:05/11/2005

12 Month Positive:05/11/2005

Did the Petition request a reclassification? **No**

For Petitioned Candidate species:

Is the listing warranted(if yes, see summary threats below) **Yes**

To Date, has publication of the proposal to list been precluded by other higher priority listing? **Yes**

Explanation of why precluded:

Higher priority listing actions, including court-approved settlements, court-ordered and statutory deadlines for petition findings and listing determinations, emergency listing determinations, and responses to litigation, continue to preclude the proposed and final listing rules for this species. We continue to monitor populations and will change its status or implement an emergency listing if necessary. The Progress on Revising the Lists section of the current CNOR (http://endangered.fws.gov/) provides information on listing actions taken during the last 12 months.

Historical States/Territories/Countries of Occurrence:

- **States/US Territories**: Hawaii
- **US Counties**: Honolulu, HI, Maui, HI
- **Countries**: United States

Current States/Counties/Territories/Countries of Occurrence:

- **States/US Territories**: Hawaii
- **US Counties**: Honolulu, HI, Maui, HI
- **Countries**: United States

Land Ownership:

Pseudognaphalium sandwicensium var. *molokaiense* is found on State and private land.

Lead Region Contact:

ARD-ECOL SVCS, Jesse D'Elia, 5032312349, jesse_delia@fws.gov

Lead Field Office Contact:

PACIFIC ISLANDS FISH AND WILDL OFC, Kristi Young, 808-792-9419, kristi_young@fws.gov

Biological Information

Species Description:

Pseudognaphalium sandwicensium var. *molokaiense* is a perennial herb, 3.9 to 25 inches (in) (10 to 64 centimeters (cm)) tall with moderate to densely woolly pubescence. Stems are olive green to white or gray and vary in their degree of erectness and branching. Leaves are linear with both surfaces densely wooly pubescent. Whitish to pale yellow flower heads occur in terminal, leafless clusters. This variety is distinguished from other varieties of the species in that the entire plant is covered in very dense white wooly pubescence; the stems are prostrate to sometimes erect, 3.9 to 11.8 in (10 to 30 cm) long; the leaves are spatulate to narrowly obovate with the lower leaves usually 0.3 to 0.8 in (7 to 20 millimeters (mm)) wide; and only the tips of the involucral bract in the flower heads are exposed while the remainder is densely wooly pubescent (Wagner et al. 1999a).

Taxonomy:

First described by Sherff and Degener (1948) as an infraspecific taxon in the genus *Gnaphalium*, Wagner (1997) moved the entire species to *Psuedognaphalium*. This variety is recognized as a distinct taxon in Wagner et al. (1999a, p. 321-322) and Wagner and Herbst (2003, p. 8), the most recently accepted Hawaiian plant taxonomy.

Habitat/Life History:

Typical habitat is strand vegetation in dry consolidated dunes (Wagner et al. 1999a, p. 321-322).

Historical Range/Distribution:

Historically, this variety was found on four Hawaiian Islands. It occurred on Molokai in Halawa Valley and Waiahewahewa gulch, on Oahu at Diamond Head and along the Waimanalo coast, on Maui in the Wailuku area, and on Lanai along the Munro trail (Hawaii Biodiversity and Mapping Program (HBMP) 2008).

Current Range Distribution:

Currently, this variety is found on Molokai on the northwestern coast at Ilio Point, Moomomi Preserve, and Nenehanaupo; and on Maui in the Waiehu dunes and the Puu Kahulianapa sea cliff (HBMP 2008).

Population Estimates/Status:

Currently, this variety is now known from five populations along the northwest coastline of Molokai totaling hundreds to perhaps as many as 20,000 individuals depending on rainfall; and from two populations on the northwest coast of Maui: one at Waiehu dunes (scattered individuals) and the second at Puu Kahulianapa (5 to 10 individuals) (Starr, in litt. 2006; Moses, in litt. 2006; Kallstrom, in litt. 2008). It was last observed on Oahu on Diamond Head crater (5 individuals) in the 1980s (HBMP 2008).

Threats

A. The present or threatened destruction, modification, or curtailment of its habitat or range:

Pseudognaphalium sandwicensium var. *molokaiense* is threatened by feral goats (Capra hircus), and axis deer (Axis axis) that adversely modify habitat (HBMP 2008; Moses, in litt. 2006; Starr, in litt. 2006; Kallstrom, in litt. 2008). Goats are being raised near the Puu Kahulianapa population on Maui (Starr, in litt. 2006).

The goat, a species originally native to the Middle East and India, was successfully introduced to the Hawaiian Islands in 1792. Currently, populations exist on Kauai, Oahu, Maui, Molokai, and Hawaii. Goats browse on introduced grasses and native plants, trample roots and seedlings, cause erosion, and promote the invasion of alien plants. They are able to forage in extremely rugged terrain and have a high reproductive capacity (Clarke and Cuddihy 1980; van Riper and van Riper 1982; Scott et al. 1986; Tomich 1986; Culliney 1988; Cuddihy and Stone 1990). The effects on mesic and wet forest habitat by the foraging of feral goats have also been reported in fencing studies. An exclosure analysis demonstrated that release from goat pressure by fencing resulted in an immediate recovery in height growth and numbers of vegetative resprouts of the native tree *Acacia koa* (koa) (Spatz and Mueller-Dombois 1973). Another study at Puuwaawaa on the island of Hawaii demonstrated that prior to management actions in 1985, regeneration of endemic shrubs and trees in the grazed area was almost totally lacking, contributing to the invasion of the forest understory by exotic grasses and weeds. After the removal of grazing animals in 1985, *A. koa* and *Metrosideros* spp. (ohia) seedlings were observed geminating by the thousands (Department of Land and Natural Resources 2002).

Axis deer were introduced to Molokai in 1868, and within 30 years the population was estimated at 7,000 animals. By 1996, the population at Kalaupapa had remarkable negative impacts on the vegetation (Dorman 1996). Axis deer eat native vegetation, trample roots and seedlings, cause erosion, promote the invasion of alien plants, and can jump fences constructed for feral pig control. The interaction of feral pigs and axis deer has reduced the *Metrosideros-Cibotium* (ohia-hapuu) rain forest to a grassy scrubland (Dorman 1996). Axis deer have moved from their preferred habitat in relatively open, lower elevation shrub areas, into the rain forest above Halawa Valley, likely due to hunting pressure (Dorman 1996). Currently, the axis deer population is estimated to be at least 1,500 on Molokai ranch lands alone and 5,000 to 6,000 animals for Molokai and Lanai combined (Dorman 1996; Nicholas, Molokai Ranch, in litt. 2006). Axis deer were introduced to Maui in 1959, with five being released east of Kihei. By 1968, the Maui population was estimated to be 85 to 90 animals and currently there is concern that their numbers could expand to between 15,000 to 20,000 individuals or more within a few years (Waring 1996; Nishibayashi, in litt. 2001; Anderson, in litt. 2001). Deer are primarily grazers, but they also browse numerous plant species including those grown as commercial crops (Waring 1996; Simpson, in litt. 2001).

Hawaiian ecosystems, having evolved without hoofed mammals, are susceptible to large-scale disturbance by introduced ungulates (Loope et al. 1991). Because of demonstrated habitat modifications by feral goats and wild deer, such as destruction of native plants, disruption of topsoil leading to erosion, and establishment and spread of nonnative plants; the U.S. Fish and Wildlife Service (FWS) believes they are a threat to this species.

Climate change may pose a threat to the ecosystem that supports this species. Fortini *et al.* (2013, pp. 1134) 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, p. 86) concluded that *Pseudognaphalium sandwicensium* var. *molokaiense* is moderately vulnerable to the impacts of climate change. Therefore, additional management actions may be needed to conserve this taxon into the future.

B. Overutilization for commercial, recreational, scientific, or educational purposes:

Pseudognaphalium sandwicensium var. *molokaiense* may be collected for making leis (floral necklaces). Off-road vehicles are a potential threat to this variety as well (HBMP 2008).

C. Disease or predation:

Predation by feral goats and wild deer is a likely threat to this variety (HBMP 2008). Goats browse on introduced grasses and native plants, and are able to reach more remote and inaccessible areas than other ungulates. They thrive on a variety of food plants, and are instrumental in the decline of native vegetation in many areas (Cuddihy and Stone 1990). The numbers of deer on Maui have been increasing since their introduction in 1959. Damage to fencing and crops has also been reported (Simpson, in litt. 2001).

Because Hawaiis native plants evolved without any browsing or grazing mammals present, many lost natural defenses to such impacts (Carlquist 1980). Therefore, even though there are no observations of direct browsing on *Pseudognaphalium sandwicensium* var. *molokaiense*, it is likely that goats and deer impact this species directly.

As of May 2013, we do not have information to indicate that disease poses a threat to *P. sandwicensium* var. *molokaiense*.

D. The inadequacy of existing regulatory mechanisms:

Pseudognaphalium sandwicensium var. *molokaiense* currently receives no protection under Hawaiis endangered species law (HRS, Sect. 195-D) or the Federal Endangered Species Act (16 U.S.C. §1531-1544).

Goats and deer are managed as game animals in Hawaii. Goat and deer hunting is allowed on all islands either year-round or during certain months, depending on the area (Hawaii Department of Land and Natural Resources 1999, 2003); however, public hunting is not adequate to eliminate this threat to *P. sandwicensium* var. *molokaiense*.

E. Other natural or manmade factors affecting its continued existence:

Alien plant species are a threat to *Pseudognaphalium sandwicensium* var. *molokaiense* as they degrade habitat and outcompete native plants (HBMP 2008; Moses, in litt. 2006). The nonnative plants reported to be the greatest threats to this species are: *Cenchrus ciliaris* (buffelgrass), *Pluchea* sp. (saltbush), *Prosopis pallida* (kiawe), and *Setaria parviflora* (foxtail) (Moses, in litt. 2006).

Cenchrus ciliaris is a grass native to Africa and tropical Asia. It is naturalized in Hawaii and common in dry areas in a wide variety of disturbed habitats. It is fire-adapted, provides fuel for fires, and recovers quickly, increasing its cover with each succeeding fire (Pacific Island Ecosystems at Risk (PIER) 2006a). We are unaware of any control methods for this species beyond herbicide application (University of Hawaii 2013).

Pluchea sp. There are two species of *Pluchea* in Hawaii, *P. indica* and *P. carolinensis*, and a cross between them (*Pluchea* x *fosbergii*). *Pluchea indica* is native to southern Asia, and *P. carolinensis* is native to Mexico, the West Indies, and South America (Wagner et al. 1999a). This 3 to 6 ft (1 to 2 m) tall, fast-growing shrub, forms thickets in dry habitats and can tolerate saline conditions. It is widespread in Hawaii from coastal areas up to almost 3,000 ft (900 m). The seeds are wind-dispersed (Francis 2006). We are unaware of any control methods for this species beyond herbicide application (University of Hawaii 2013).

Prosopis pallida was introduced to Hawaii in 1828, and its seeds were used as fodder for ranch animals. The seeds were quickly spread by ranch animals. Kiawe became a dominant component of the vegetation in low elevation, dry, disturbed sites, as it is well adapted to dry habitats. It overshadows other vegetation and the deep tap roots use all available water. This species fixes nitrogen and can outcompete native species (Wagner et al. 1999; PIER 2006b). We are unaware of any control methods for this species beyond herbicide application (University of Hawaii 2013).

Setaria parviflora is a perennial grass native to Europe, introduced to Hawaii around 1895. This grass is naturalized in a wide variety of habitat, from wet to dry, low, to high elevations, in pastures, urban sites, and agricultural lands. The culms can be up to 4 ft (1.2 m) tall, shading and crowding out native plant species (OConnor 1999). *S. parviflora* may occur as a single plant or as a significant colony (University of Florida 2005). We are unaware of any control methods for this species beyond herbicide application (University of Hawaii 2013).

The original native flora of Hawaii consisted of about 1,400 species, nearly 90 percent of which were endemic. Of the total native and naturalized Hawaiian flora of 1,817 taxa, 47 percent were introduced from other parts of the world, and nearly 100 of those species are considered pests (Smith 1985; Wagner et al. 1999a). Confirmed personal observations (Moses, in litt. 2006) and several studies (Cuddihy and Stone 1990; Wood and Perlman 1997; Robichaux et al. 1998, p. 4) indicate nonnative plant species may outcompete native plants similar to *P. sandwicensium* var. *molokaiense*. Competition may be for space, light, water, or nutrients, or there may be a chemical produced that inhibits growth of other plants (Smith 1985; Cuddihy and Stone 1990). In addition, nonnative pest plants found in habitat similar to that of this species have been shown to make the habitat less suitable for native species (Smathers and Gardner 1978; Smith 1985; Loope and Medeiros 1992; Medeiros et al. 1992; Ellshoff et al. 1995; Meyer and Florence 1996; Medeiros et al. 1997; Loope et al. 2004). In particular, alien pest plant species degrade habitat by modifying availability of light, altering soil-water regimes, modifying nutrient cycling, or altering fire characteristics of native plant communities (Smith 1985; Cuddihy and Stone 1990; Vitousek et al. 1997). Because of demonstrated habitat modification and resource competition by nonnative plant species in habitat similar to the coastal dune habitat of *P. sandwicensium* var. *molokaiense*, the FWS believes nonnative plant species are a threat to this species.

In addition, species like *P. sandwicensium* var. *molokaiense* that are endemic to small islands are inherently more vulnerable to extinction than widespread species because of the higher risks posed to a few populations and individuals by genetic bottlenecks, random demographic fluctuations and localized catastrophes such as hurricanes (Pimm et al. 1988; Mangel and Tier 1994).

Conservation Measures Planned or Implemented :

Weed control is ongoing at the Moomomi Preserve population of *Pseudognaphalium sandwicensium* var. *molokaiense* on Molokai (The Nature Conservancy of Hawaii 2007; Kallstrom, in litt. 2008). This species is currently not represented in an ex situ collection (Conry, in litt. 2012).

Summary of Threats :

Based on our evaluation of habitat degradation and loss by feral goats, axis deer, and nonnative plants, we conclude there is sufficient information to develop a proposed rule for this species due to the present and threatened destruction, modification, or curtailment of its habitat and range, and the displacement of individuals of *Pseudognaphalium sandwicensium* var. *molokaiense*, due to competition with nonnative plants for space, nutrients, water, air, and light. Randomly occurring natural events are a likely threat to this variety due to small population sizes. Potential threats include destruction by off-road vehicles and collection for lei-making. We find that this species is warranted for listing throughout all of its range, and, therefore, find that it is unnecessary to analyze whether it is threatened or endangered in a significant portion of its range.

For species that are being removed from candidate status:

_____ Is the removal based in whole or in part on one or more individual conservation efforts that you determined met the standards in the Policy for Evaluation of Conservation Efforts When Making Listing Decisions(PECE)?

Recommended Conservation Measures :

- Survey for populations of *Pseudognaphalium sandwicensium* var. *molokaiense* in areas of potentially suitable habitat.
- Control feral goats and axis deer by removing these species from areas where *P. sandwicensium* var. *molokaiense* populations exist and preventing reinvasion through the use of exclosures
- Control alien plants through physical, mechanical, and biological control methods, as well as herbicides when necessary. Continue to conduct research into potential biocontrol species.
- Initiate propagation efforts for maintenance of genetic stock.
- Reintroduce individuals into suitable habitat within historic range that is being managed for known threats to this species.

Priority Table

Magnitude	Immediacy	Taxonomy	Priority
High	**Imminent**	Monotypic genus	1
		Species	2
		Subspecies/Population	**3**
	Non-imminent	Monotypic genus	4
		Species	5
		Subspecies/Population	6
Moderate to Low	Imminent	Monotype genus	7
		Species	8
		Subspecies/Population	9
	Non-Imminent	Monotype genus	10
		Species	11
		Subspecies/Population	12

Rationale for Change in Listing Priority Number:

Magnitude:

This species is highly threatened by feral goats (Maui) and axis deer (Maui and Molokai), that degrade and destroy habitat, and by nonnative plants that compete for light and nutrients. Potential threats include collection for lei and damage or destruction of individuals and habitat by off-road vehicles. Threats to the strand vegetation in the dry consolidated dune habitat of *Pseudognaphalium sandwicensium* var. *molokaiense* , and to individuals of this species, occur throughout its range and are expected to continue or increase without their control or eradication. While weed control protects one population on Molokai, no conservation efforts have been initiated to date for the remaining populations on Molokai or on Maui.

Imminence :

Threats to *Pseudognaphalium sandwicensium* var. *molokaiense* from feral goats and axis deer, and nonnative plants are considered imminent because they are ongoing.

__Yes__ Have you promptly reviewed all of the information received regarding the species for the purpose of determination whether emergency listing is needed?

Emergency Listing Review

__No__ Is Emergency Listing Warranted?

The species does not appear to be appropriate for emergency listing at this time because the immediacy of the threats is not so great as to imperil a significant proportion of the taxon within the time frame of the routine listing process. Weed control protects one population of *Pseudognaphalium sandwicensium* var. *molokaiense* on Molokai. However, no conservation efforts have been initiated to date for the populations on Maui. If it becomes apparent that the routine listing process is not sufficient to prevent large losses that may result in this species' extinction, then the emergency rule process for this species will be initiated. We will continue to monitor the status of *P. sandwicensium* var. *molokaiense* as new information becomes available. This review will determine if a change in status is warranted, including the need to make prompt use of emergency listing procedures.

Description of Monitoring:

Much of the information on this form is based on the results of a meeting of 20 botanical experts held by the Center for Plant Conservation in December of 1995. We incorporated additional information on this species from our files and the most recent supplement to the Manual of Flowering Plants of Hawaii (Wagner and Herbst 2003). In 2004, the Pacific Islands Office contacted the following species experts: Robert Hobdy, retired from the Hawaii Division of Forestry and Wildlife; Joel Lau, Hawaii Biodiversity and Mapping Program; Arthur Medeiros, U.S.Geological Survey, Biological Resources Discipline (USGS-BRD); Hank Oppenheimer, resource manager for the Maui Land and Pineapple Company; and Steve Perlman and Ken Wood, National Tropical Botanical Garden (NTBG). No new information was provided. In 2005 we contacted species experts, and confirmation of the status was provided by Wailana Moses of The Nature Conservancy of Hawaii (TNC). In 2006 new status information was provided by F. Starr, USGS-BRD, S. Seidman, Maui Nui Botanical Gardens, and W. Moses, The Nature Conservancy of Hawaii. No new information was received in 2008. In 2009 we received new information from Russell Kallstrom. No new information was received in 2010. In 2011, we contacted the species experts listed below and received no new information. In 2012, we received information from the State and incorporated it into this form.

List all experts contacted in 2011:

Name Date Affiliation
Agorastos, Nick 02/16/11 Division of Forestry and Wildlife, Hawaii
Bakutis, Ane 02/16/11 Plant Extinction Prevention Program, Molokai
Ball, Donna 02/16/11 U.S. FWS, Partners Program, Hawaii
Bily, Pat 02/16/11 The Nature Conservancy, Maui
Bio, Kealii 02/16/11 Plant Extinction Prevention Program, Hawaii
Caraway, Vickie 02/22/11 Hawaii Division of Forestry and Wildlife, Oahu
Ching, Susan 02/16/11 Plant Extinction Prevention Program, Oahu
Clark, Michelle 02/16/11 U.S. FWS, Partners Program, Kauai
Duvall, Fern 02/16/11 Hawaii Division of Forestry and Wildlife, Maui
Fay, Kerri 02/16/11 The Nature Conservancy, Maui
Garnett, Bill 02/16/11 National Park Service, Kalaupapa, Molokai
Haus, Bill 02/16/11 National Park Service, Haleakala NP, Maui
Higashino, Jennifer 02/16/11 U.S. FWS, Partners Program, Maui
Imada, Clyde 02/16/11 Bishop Museum, Botany Department
Kawelo, Kapua 02/16/11 U.S. Army, Environmental Division
McDowell, Wendy 02/16/11 Plant Extinction Prevention Program, Kauai
Medeiros, Arthur 02/16/11 U.S. Geological Survey
Moses, Wailana 02/16/11 The Nature Conservancy, Molokai
Oppenheimer, Hank 02/16/11 Plant Extinction Prevention Program, Maui Nui

Perlman, Steve 02/16/11 National Tropical Botanical Garden
Perry, Lyman 02/16/11 Division of Forestry and Wildlife, Hawaii
Pratt, Linda 02/16/11 U.S.G.S., Biological Resources Division
Starr, Forest 02/16/11 U.S. Geological Survey
Stevens, Bryon 02/16/11 DLNR Natural Area Reserves, Maui
Ward, Joe 02/22/11 Puu Kukui Watershed Preserve
Welton, Patti 02/16/11 National Park Service, Haleakala NP, Maui
Wysong, Michael 02/16/11 DLNR Natural Area Reserves, Kauai

The Hawaii Biodiversity and Mapping Program identified this species as vulnerable (HBMP 2006). Based on the International Union for Conservation of Nature and Natural Resources Red List of Threatened Species, this species is recognized as Endangered (facing a very high risk of extinction in the wild) by Wagner et al. (1999b). *Pseudognaphalium sandwicensium* var. *molokaiense* is not included in the list of species in Hawaiis 2005 Comprehensive Wildlife Conservation Strategy (Mitchell et al. 2005).

Indicate which State(s) (within the range of the species) provided information or comments on the species or latest species assessment:

Hawaii

Indicate which State(s) did not provide any information or comment:

none

State Coordination:

On February 20, 2013, we provided the Hawaii Division of Forestry and Wildlife with copies of our most recent candidate assessments for their review and comment. New information was received on April 12, 2013, and incorporated into this report. In addition, we are in frequent contact with State botanists and, PEPP, a multiagency (including State and Federal) organization operated by the University of Hawaii that functions to prevent extinction of Hawaiis rarest and most threatened plants. Therefore, we believe this assessment contains the most recent available information on *Pseudognaphalium sandwicensium* var. *molokaiense*.

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Approval/Concurrence:

Lead Regions must obtain written concurrence from all other Regions within the range of the species before recommending changes, including elevations or removals from candidate status and listing priority changes; the Regional Director must approve all such recommendations. The Director must concur on all resubmitted 12-month petition findings, additions or removal of species from candidate status, and listing priority changes.

Approve:  06/18/2014
Date

Concur:  11/18/2014
Date

Did not concur: _____ _____
Date

Director's Remarks: