5-YEAR REVIEW

Short Form Summary

Species Reviewed: *Dubautia plantaginea* ssp. *humilis* (Naenae)

Current Classification: Endangered

Federal Register Notice announcing initiation of this review:

[USFWS] U.S. Fish and Wildlife Service. 2007. Endangered and threatened wildlife and plants; initiation of 5-year reviews of 71 species in Oregon, Hawaii, Commonwealth of the Northern Mariana Islands, and Territory of Guam. Federal Register 72(45):10547-10550.

Lead Region/Field Office:

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

Name of Reviewer(s):

Holly Freifeld, Fish and Wildlife Biologist
Marie Bruegmann, Plant Recovery Coordinator
Marilet A. Zablan, Recovery Program Leader and acting Assistant Field Supervisor for Endangered Species
Gina Shultz, 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 March 8, 2007. The review was based on the final critical habitat designation for *Dubautia plantaginea* ssp. *humilis* and other species from the island of Maui, as well as a review of current, available information (USFWS 2003). The Bernice P. Bishop Museum provided an initial draft of portions of the 5-year review and they also provided recommendations for conservation actions needed prior to the next five-year review. The evaluation of the status of the species was prepared by our lead PIFWO biologist and reviewed by the Plant Recovery Coordinator. The document was then reviewed by the Recovery Program Leader and acting Assistant Field Supervisor for Endangered Species, and 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 designation for *Dubautia plantaginea* ssp. *humilis* published in the Federal Register on May 14, 2003 (USFWS 2003) 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 *D. plantaginea* ssp. *humilis*.

At the time of listing, *Dubautia plantaginea* ssp. *humilis* had been reported only from two locations in Iao Valley, on West Maui. Both populations were on privately owned land, and totaled fewer than 300 individuals (USFWS 1999). In 1999, one population was lost to a landslide, and when the recovery plan including this subspecies was published, the single remaining population was estimated at 60 to 65 individuals (USFWS 2002). By June, 2006, the single population contained approximately 50 individuals (Plant Extinction Prevention Program 2008).

Dubautia plantaginea ssp. *humilis* is a short-lived perennial of the aster family (Asteraceae). This subspecies differs from the other two subspecies (*D. plantaginea* ssp. *magnifolia* and *D. plantaginea* ssp. *plantaginea*) by having fewer heads per inflorescence but more florets per head. The taxon is self-incompatible, meaning flowers must be pollinated by pollen from a different plant. Little else is known about the life history of *D. plantaginea* ssp. *humilis*. Flowering cycles, pollination vectors, seed dispersal agents, longevity, specific environmental requirements, and limiting factors are unknown (USFWS 1999). Typical habitat for this subspecies is wet, barren, wind-blown cliffs, between 350 to 400 m (1,150 to 1,300 ft) elevation (Hawaii Biodiversity and Mapping Program 2007).

Major threats to *Dubautia plantaginea* ssp. *humilis* include: landslides (Factor E); rockslides (Factor E); erosion (Factor E); flooding (Factor E); and displacement by introduced invasive plant species, including *Paspalum conjugatum* (Hilo grass), *Psidium guajava* (common guava), *Casuarina equisetifolia* (ironwood), *Sporobolus africanus* (smutgrass), and *Pluchea carolinensis* (sourbush), *Blechnum appendiculatum* (no common name), *Erigeron karvinskianus* (daisy fleabane), *Oplismenus hirtellus* (basketgrass), *Rubus rosifolius* (thimbleberry), *Lythrum maritimum* (loosestrife), and *Adiantum raddianum* (maidenhair fern) (Jensen and Russell 1999; USFWS 2002) (Factor E). Unrestricted collecting for scientific or horticultural purposes, or excessive visitation by humans (Factor B) remains as a potential threat due to the low individual and population numbers (USFWS 1999; USFWS 2002).

In addition to the threats described above, taxa such as *Dubautia plantaginea* ssp. *humilis* that are restricted to a small portions of a single island are inherently more vulnerable to extinction than widespread species because of the higher risks posed to a few populations and individuals by random demographic fluctuations and localized catastrophes such as fires, hurricanes, landslides, flooding and disease outbreaks (Factor E). When considered on their own, the natural processes associated with being a single island endemic do not affect *D. plantaginea* ssp. *humilis* to such a degree that it is threatened or endangered with extinction in the foreseeable future, but these natural processes can exacerbate the threat from anthropogenic factors. For example, one population was lost to a landslide in 1999 (USFWS 2002).

Dubautia plantaginea ssp. *humilis* is declining in both distribution and number of individuals. Reduced to only a single population of approximately 50 individuals, the species is threatened by habitat destruction due to landslides, competition by introduced invasive plant species, and random environmental events that might eliminate the population. The small number of mature individuals remaining and reduced gene pool may repress reproductive vigor, further threatening the taxon.

To safeguard the remaining genetic variation in this subspecies, seeds have been collected and placed in storage or propagation at several institutions. Seeds were collected from six individuals in 2006 and three individuals in 2008, and were sent to the National Tropical Botanical Garden and Lyon Arboretum (Plant Extinction Prevention Program 2007, 2008). In 2007, 3,819 seed from five Iao Valley individuals remained in storage at National Tropical Botanical Garden, with 22 seedlings in living collections (National Tropical Botanical Garden 2007), and 3,835 seeds in 14 accessions stored at the University of Hawaii's Lyon Arboretum Micropropagation Laboratory (2007). A single individual representing the Iao Valley population is also in refugia at Maui Nui Botanical Garden (2008). Due to the inaccessibility of the majority of individuals, seed collection from all remaining individuals is impossible (H. Oppenheimer, Plant Extinction Prevention Program, pers. comm., 2008). While species within the genus *Dubautia* can be propagated by seed and cuttings, endangered species in the genus are documented to have seed with low viability, possibly due to inbreeding depression (Lilleeng-Rosenberger 2005).

Stabilizing, downlisting, and delisting objectives are provided in the Addendum to the Recovery Plan for Multi-island Species (USFWS 2002), based on whether the species is an annual, a short-lived perennial (fewer than 10 years), or a long-lived perennial. *Dubautia plantaginea* ssp. *humilis* is a short-lived perennial, and to be considered stabilized, which is the first step in recovering the species, 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 island of Maui. Each of these populations must be naturally reproducing and increasing in number, with a minimum of 50 mature individuals per population.

The stabilization and recovery goals for this species have not been met, as only one population of approximately 50 individuals is known and management is nearly impossible, due to the steep cliff on which the plants grow. Therefore, *Dubautia plantaginea* ssp. *humilis* meets the definition of endangered as it remains in danger of extinction throughout its range.

Recommendations for Future Actions:

- Maintain adequate genetic stock for *ex situ* propagation.
- Determine methods to access and manage introduced invasive plant species in remaining wild population.
- Establish new populations in suitable habitat through propagation and outplanting.
- Initiate planning and contribute to implementation of ecosystem level restoration and management to benefit this species.

References:

Harold L. Lyon Arboretum Micropropagation Laboratory. 2007. Micropropagation Database. University of Hawaii at Manoa, Honolulu, Hawaii. Unpublished.

Hawaii Biodiversity and Mapping Program. 2007. Program Database. Unpublished.

Lilleeng-Rosenberger, K.E. 2005. Growing Hawai‘i’s native plants. Mutual Publishing, Honolulu, HI. 416 pages.

Maui Nui Botanical Garden. 2008. Report on controlled propagation of listed and candidate species, as designated under the U.S. Endangered Species Act. Unpublished.

National Tropical Botanical Garden. 2007. Report on controlled propagation of listed and candidate species, as designated under the U.S. Endangered Species Act. Unpublished.

Plant Extinction Prevention Program. 2007. Annual performance report (July 1, 2006 to June 30, 2007), Plant Extinction Prevention (PEP) program for Oahu, Maui Nui, Hawaii. Unpublished.

Plant Extinction Prevention Program. 2008. Section 6 annual performance report for endangered plant restoration and enhancement - Plant Extinction Prevention (formerly Genetic Safety Net), Fiscal Year 2008 (July 1, 2007 – June 30, 2008). Hawaii Department of Land and Natural Resources, Division of Forestry and Wildlife. 113 pages. Unpublished.

[USFWS] U.S. Fish and Wildlife Service. 1999. Endangered and hreatened Wildlife and plants; final endangered status for 10 plant taxa from Maui Nui, Hawaii: final rule. Federal Register 64:48307-48323.

[USFWS] U.S. Fish and Wildlife Service. 2002. Addendum to the recovery plan for the multi-island Plants. U.S. Fish and Wildlife Service, Portland, Oregon,. 125+ viii pages.

[USFWS] U.S. Fish and Wildlife Service. 2003. Endangered and threatened wildlife and plants; designation of critical habitat for 60 plant species from the islands of Maui and Kahoolawe, Hawaii: final rule. Federal Register 68: 25934-25982.

Personal Communications:

Oppenheimer, Hank. Maui Nui Coordinator, Plant Extinction Prevention Program. Email communication to Bernice P. Bishop Museum on Oppenheimer, Hank. Maui Nui Coordinator, Plant Extinction Prevention Program. Email communication to Bernice P. Bishop Museum on May 19, 2008.

Table 1. Status of *Dubautia plantaginea* ssp. *humilis* (Naenae) **from listing through 5-year review**.

Date	No. wild indivs	No. outplanted	Stability Criteria identified in Recovery Plan	Stability Criteria Completed?
1999 (listing)	< 300	0	All threats managed in all 3 populations	No
			Complete genetic storage	No
			3 populations with 50 mature individuals each	Partially
2002 (recovery plan)	60-65	0	All threats managed in all 3 populations	No
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	Partially
2003 (critical habitat)	60-65	0	All threats managed in all 3 populations	No
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each (150 total)	Partially
2008 (5-year review)	50	0	All threats managed	No
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	Partially

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SIGNATURE PAGE for 5-YEAR REVIEW of *Dubautia plantaginea* ssp. *humilis* (Naenae)

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

Acting Field Supervisor, Pacific Islands Fish and Wildlife Office

Date 21 July 2009