

Hedyotis degeneri
(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
***Hedyotis degeneri* (No common name)**

I. GENERAL INFORMATION

A. Methodology used to complete the review:

This review was conducted by staff of the Pacific Islands Fish and Wildlife Office (PIFWO) of the Fish and Wildlife Service between July 2005 and June 2006. The Hawaii Biodiversity and Mapping Program was contracted to provide updated information on the current status of *Hedyotis degeneri*. They also provided recommendations for future actions that may be needed prior to the next 5-year review. The evaluation of the lead PIFWO biologist was reviewed by the Plant Recovery Coordinator, whose comments were incorporated into the draft 5-year Review. The draft 5-year Review was then reviewed by the Recovery Program Leader and the Assistant Field Supervisor for Endangered Species before PIFWO submission to the Regional Office.

B. Reviewers

Lead Region: Region 1

Lead Field Office: Pacific Islands Fish and Wildlife Office

C. Background

1. FR Notice citation announcing initiation of this review:

U.S. Fish and Wildlife Service. July 6, 2005. Endangered and Threatened Wildlife and Plants; Initiation of 5-year Reviews (of 33 species in Region 1). 70 FR 38972-38975.

2. Species status:

Stable (FY 2006 Recovery Data Call)

3. Recovery achieved:

1, meaning 0 - 25 percent of the identified recovery objectives for *Hedyotis degeneri* have been achieved (FY 2006 Recovery Data Call)

4. Listing history

Original Listing

FR notice: U.S. Fish and Wildlife Service. 1991. Endangered and threatened wildlife and plants; determination of endangered status for 26 plants from the Waianae Mountains, island of Oahu, Hawaii. *Federal Register* 56(209): 55770-55786.

Date listed: October 29, 1991

Entity listed: Species

Classification: Endangered

Revised Listing, if applicable

N/A

5. Associated actions:

Critical habitat was designated for *Hedyotis degeneri* in two units totaling 2,294 acres (929 hectares) on Oahu (U.S. Fish and Wildlife Service. 2003. Endangered and threatened wildlife and plants; final designations or nondesignations of critical habitat for 101 plant species from the island of Oahu, Hawaii. *Federal Register* 68(116): 35950-36406).

6. Review History: Just the original listing, designation of critical habitat, and recovery plan development actions.

7. Species' Recovery Priority Number at start of: 5, meaning a species with a high degree of threat and a low recovery potential.

8. Recovery Plan or Outline

Name of plan: Recovery Plan for the Oahu Plants. 1998. U.S. Fish and Wildlife Service, Portland, Oregon. 207 pp. plus appendices

Date issued: August 10, 1998

Dates of previous revisions: N/A

Some of the actions outlined in the Recovery Plan have been initiated but not completed (*e.g.*, construct exclosures to protect populations from feral pigs; control nonnative plants within fenced exclosures). Some recovery actions will require long-term commitments (*e.g.*, maintenance of exclosure fences, weed control) or may only be necessary intermittently (*e.g.*, provide protection against fire).

II. REVIEW ANALYSIS

A. Application of the 1996 Distinct Population Segment (DPS) Policy

This Policy does not apply to plant species.

B. Recovery Criteria

1. Does the species have a final, approved recovery plan?

Yes
 No

2. Does the recovery plan contain recovery (i.e., downlisting or delisting) criteria?

Yes
 No

3. **Adequacy of recovery criteria.**
- a. **Do the recovery criteria reflect the best available (i.e., most up-to-date) information on the biology of the species and its habitat?**
 Yes
 No
- b. **Are all of the 5 listing factors that are relevant to the species addressed in the recovery criteria (and there is no new information to consider regarding existing or new threats)?**
 Yes
 No
4. **List the recovery criteria as they appear in the recovery plan, and discuss how each criterion has or has not been met, citing information. For threats-related recovery criteria, please note which of the 5 listing factors* are addressed by that criterion. If any of the 5-listing factors are not relevant to this species, please note that here.**

The threats (Factors A, C, and E) affecting this species are discussed in detail in section II.D. Factors B and D are not considered a threat to this species.

Stabilizing, downlisting, and delisting objectives are provided in the Recovery Plan for Oahu Plants (Service 1998), based on whether the species is an annual, a short-lived perennial (fewer than 10 years), or a long-lived perennial. *Hedyotis degeneri* is a short-lived perennial, and to be considered stable, this species must be managed to control threats (e.g., fenced) (Factors A, C, and E) and be represented in an *ex situ* collection. In addition, a minimum of three populations should be documented on the island of Oahu 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.

This recovery objective has not been met.

For downlisting, a total of five to seven populations of *Hedyotis degeneri* should be documented on the island of Oahu where it now occurs or occurred historically. Each of these populations must be naturally reproducing, stable or increasing in number, and secure from threats (Factors A, C, and E), with a minimum of 300 mature individuals per population. Each population should persist at this level for a minimum of 5 consecutive years before downlisting is considered.

This recovery objective has not been met.

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- A) Present or threatened destruction, modification or curtailment of its habitat or range;
 - B) Overutilization for commercial, recreational, scientific, or educational purposes;
 - C) Disease or predation;
 - D) Inadequacy of existing regulatory mechanisms;
 - E) Other natural or manmade factors affecting its continued existence.

For delisting, a total of 8 to 10 populations of *Hedyotis degeneri* should be documented on the island of Oahu where it now occurs or occurred historically. Each of these populations must be naturally reproducing, stable or increasing in number, and secure from threats (Factors A, C, and E), with 300 mature individuals per population for short-lived perennials. Each population should persist at this level for a minimum of 5 consecutive years before delisting is considered.

This recovery objective has not been met.

C. Synthesis

Historically, *Hedyotis degeneri* was known from Mt. Kaala in the northern Waianae mountains on Oahu (Wagner *et al.* 1999a). Two varieties were recognized; the typical var. *degeneri*, and one with narrower leaves, var. *coprosmifolia*. Variety *coprosmifolia* has not been collected since the 1980s, and no current occurrences are known. At the time of listing in 1991, *H. degeneri* was known from Kamaileunu Ridge in the Waianae mountains. In 1998 when the Recovery Plan was published, there were 3 populations: one consisting of 6 individuals on Kamaileunu Ridge, one of 25 individuals near Pahole Gulch, and one individual in Makaleha Valley. Currently, *H. degeneri* is known from four scattered populations from Pahole Gulch to Kahanahaiki Valley, Alaihehe Gulch and Manuwai Gulch, and East, Central and West Makaleha Valley (HBMP 2005). These populations total approximately 370 individuals. The increase in numbers does not reflect recorded changes in population sizes of the species, but is the result of the increased number of surveys. No individuals of variety *coprosmifolia* are currently known, but specimens were collected as recently as the 1980s, and there is much unsurveyed habitat that is difficult to access where it could be extant (J. Lau, Hawaii Biodiversity and Mapping Program, pers. comm. 2006).

Habitat degradation by feral pigs (*Sus scrofa*) and goats (*Capra hircus*) is considered one of the major threats to *Hedyotis degeneri* (Factor A) (Makua Implementation Team 2003). As early as 1778, European explorers introduced livestock, which became feral, increased in number and range, and caused significant changes to the natural environment of Hawaii. The pig is originally native to Europe, northern Africa, Asia Minor, and Asia. European pigs became feral and invaded forested areas, especially wet and mesic forests and dry areas at high elevations. Feral pigs are currently present on Oahu and inhabit rain forests and grasslands. While rooting in the ground in search of the invertebrates and plant material they eat, feral pigs disturb and destroy vegetative cover, trample plants and seedlings, and threaten forest regeneration by damaging seeds and seedlings. They disturb soil and cause erosion, especially on slopes. Alien plant seeds are dispersed on their hooves and coats as well as through their digestive tracts, and the disturbed soil is fertilized by their feces, helping these plants to establish. Feral pigs are a major vector in the spread of many introduced plant species (Smith 1985; Stone 1985; Medeiros *et al.* 1986; Scott *et al.* 1986; Tomich 1986; Cuddihy and Stone 1990; Wagner *et al.* 1999b). The goat, a species originally native to the Middle East and India, was successfully introduced to the Hawaiian Islands in 1792. Feral goats eat native vegetation, 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; Culliney 1988; Scott *et al.* 1986; Tomich 1986; van Riper and van Riper 1982; Cuddihy and Stone 1990). Under the terms of the 1999, 2001, and 2004 U.S. Fish and Wildlife Service Biological Opinions for Routine Military Training at Makua Military Reservation and the subsequent 2003 Makua Implementation Plan, the Army began fencing individuals of *H. degeneri* (Makua Implementation Team 2003). The *H. degeneri* individuals in Kahanahaiki Valley and Pahole Gulch are treated as a single population for management by the Army (U.S. Army 2005). The Army also plans to manage one population in the gulches of Alaiheihe and Manuwai, and one population ranging from Central Makaleha Valley to the west branch of East Makaleha Valley. The *H. degeneri* plants in Kahanahaiki Valley are located outside the present enclosure fence in the valley, and may be included in the Kahanahaiki subunit fence scheduled for construction in 2008. The Army's goal is 100 percent exclusion of feral ungulates within these fenced areas (Makua Implementation Team 2003). The State of Hawaii's Division of Forestry and Wildlife fenced the Pahole Gulch portion of the species' range in 1996 (Hawaii Division of Forestry and Wildlife 1996). This fenced unit has been ungulate free since 1998.

Fire is considered a threat, as *Hedyotis degeneri* occurs in mesic forests which often become very dry in the summer months and *H. degeneri* is not considered fire tolerant (Factors A and E) (Makua Implementation Team 2003). One of the potential sources of fire is from military training activities on the Makua Military Reservation. The Army has addressed the threat of fire from their training actions by developing and implementing a fire management plan to minimize the number of ignitions in the reservation, to respond rapidly to any ignitions, and to maintain fire breaks to help contain any ignitions away from the endangered species locations (U.S. Army 2003).

Feral pigs and goats not only degrade the habitat of *Hedyotis degeneri*, but also cause harm to the plants by feeding on them, trampling them, or uprooting them in search of invertebrate food (Factor C) (Service 1998; U.S. Army 2003; 56 FR 55770; 68 FR 35950). See above for conservation measures that have been implemented to reduce the threats from feral pigs and goats.

Competition with and habitat degradation by invasive alien plant species is a major threat to *Hedyotis degeneri* (Factors A and C) (56 FR 55770; 68 FR 35960). At the time of listing the primary nonnative plant species impacting *H. degeneri* were *Schinus terebinthifolius* (Christmas berry), *Melinis minutiflorus* (molasses grass), and *Psidium cattleianum* (strawberry guava). Currently the primary invasive nonnative plant species impacting *H. degeneri* are *Ageratina adenophora* (Maui pamakani), *Blechnum appendiculatum*, *Clidemia hirta* (Koster's curse), *Grevillea robusta* (silk oak), *Psidium cattleianum* (strawberry guava), *Psidium guajava* (common guava), *Rubus argutus* (prickly Florida blackberry), *Schinus terebinthifolius*, and *Toona ciliata* (Australian red cedar) (68 FR 35950). The *H. degeneri* individuals in Kahanahaiki Valley and Pahole Gulch are treated as a single population for management by the Army, and control of invasive nonnative plant species is ongoing (U.S. Army 2005). The Army also plans to manage one population in the gulches of Alaiheihe and Manuwai, and one population ranging from Central Makaleha Valley to the west branch of East Makaleha Valley.

In addition to all of the other threats, species like *Hedyotis degeneri* that are endemic to a small portion 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 hurricanes and disease outbreaks (Factor E).

The Army is addressing the threats to this species from the small number of populations and the small population sizes through genetic storage and propagation for eventual reintroduction (Makua Implementation Team 2003). Propagation for genetic storage and reintroduction is occurring in the Army's baseyard and the University of Hawaii's Lyon Arboretum Micropropagation and Seed Storage Laboratories, the National Tropical Botanical Garden, the state of Hawaii's Division of Forestry and Wildlife's Pahole Rare Plant Facility, and at the Audubon Society's Waimea Valley Park. These organizations and agencies are working together to store genetic material long-term against stochastic events and to supply the Army with plants for reintroductions (Service 2005; U.S. Army 2005). The goal for genetic storage of *H. degeneri* is to collect seeds from up to 50 individuals from each population (Makua Implementation Team 2003). This goal has been partially met (U.S. Army 2005). *Hedyotis degeneri* is comprised of two varieties: var. *degeneri* and var. *coprosmifolia*. Genetic studies show that *H. degeneri* var. *coprosmifolia* is more closely related to *H. schlechtendaliana* and *H. schlechtendaliana* var. *waimeae*. *Hedyotis degeneri* var. *degeneri* is more similar to *H. schlechtendaliana* var. *remyi*, *H. littoralis*, *H. mannii*, and an as yet undescribed species from the island of Hawaii (T. Motley, New York Botanical Garden, *in litt.* 2006). No outplantings are proposed for *H. degeneri* var. *degeneri*, but if they were to be carried out, it would be important to avoid outplanting close to populations of *H. degeneri* var. *coprosmifolia* or the closely related *H. schlehtendahliana*. The target goals for each population are 50 mature, reproducing individuals (U.S. Army 2005).

The goals for genetic storage of *Hedyotis degeneri* have been partially met. The stabilization, downlisting, and recovery goals for this species have not been met and, therefore, *H. degeneri* meets the definition of endangered as it remains in danger of extinction throughout all of its range.

III. RESULTS

A. Recommended Classification

- Yes, downlist to Threatened
- Yes, uplist to Endangered
- Yes, delist
- No, no change is needed

B. New Recovery Priority Number NA

IV. RECOMMENDATIONS FOR FUTURE ACTIONS

- Search for individuals of *Hedyotis degeneri* var. *coprosmifolia*, as none are known to be extant.
- Study *Hedyotis degeneri* populations with regard to population size and structure, geographical distribution, flowering cycles, pollination vectors, seed dispersal agents, longevity, specific environmental requirements, limiting factors, and threats to the species.
- Reintroduce additional populations of *Hedyotis degeneri* in managed habitat with its historical range.

V. REFERENCES

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U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW of *Hedyotis degeneri* (No common name)

Current Classification Endangered

Recommendation resulting from the 5-Year Review

- Downlist to Threatened
- Uplist to Endangered
- Delist
- No change is needed

Appropriate Listing/Reclassification Priority Number N/A

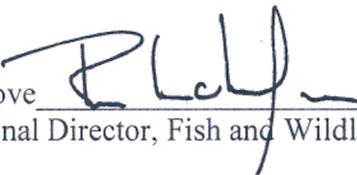
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Date JUL - 3 2007

Field Supervisor, Fish and Wildlife Service

Approve 

Date Aug 2 2007

Regional Director, Fish and Wildlife Service