

Nototrichium humile
(Kulu`i)

**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: *Nototrichium humile* (Kulu'i)

TABLE OF CONTENTS

1.0	GENERAL INFORMATION	1
1.1	Reviewers	1
1.2	Methodology used to complete the review	1
1.3	Background	1
2.0	REVIEW ANALYSIS.....	3
2.1	Application of the 1996 Distinct Population Segment (DPS) policy	3
2.2	Recovery Criteria.....	3
2.3	Updated Information and Current Species Status	4
2.4	Synthesis.....	6
3.0	RESULTS	8
3.1	Recommended Classification	8
3.2	New Recovery Priority Number	8
3.3	Listing and Reclassification Priority Number.....	8
4.0	RECOMMENDATIONS FOR FUTURE ACTIONS	9
5.0	REFERENCES.....	9
	Signature Page.....	11

5-YEAR REVIEW
***Nototrichium humile* (Kulu`i)**

1.0 GENERAL INFORMATION

1.1 Reviewers

Lead Regional Office:

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

Lead Field Office:

Pacific Islands Fish and Wildlife Office, Gina Shultz, Assistant Field Supervisor for Endangered Species, (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 (PIFWO) of the U.S. Fish and Wildlife Service (USFWS) between June 2006 and September 2007. The Hawaii Biodiversity and Mapping Program provided most of the updated information on the current status of *Nototrichium humile*. They also provided recommendations for conservation actions that may be needed prior to the next five-year review. The evaluation of the Plant Recovery Coordinator was reviewed by the Recovery Program Leader and the Assistant Field Supervisor for Endangered Species before final approval.

1.3 Background:

1.3.1 FR Notice citation announcing initiation of this review:

USFWS. 2006. Endangered and threatened wildlife and plants; initiation of 5-year reviews of 70 species in Idaho, Oregon, Washington, Hawaii, and Guam. Federal Register 71(69):18345-18348.

1.3.2 Listing history

Original Listing

FR notice: USFWS. 1996. Endangered and threatened wildlife and plants; determination of endangered status for 26 plants from the Waianae Mountains, island of Oahu, Hawaii; final rule. Federal Register 58(209):55770-55786.

Date listed: October 10, 1996
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. 2003a. Endangered and threatened wildlife and plants; final designation or nondesignation of critical habitat for 101 plant species from the island of Oahu, HI; final rule. Federal Register 68(116):35950-36406.

[USFWS] U.S. Fish and Wildlife Service. 2003b. Endangered and threatened wildlife and plants; designation of critical habitat for 60 plant species from the islands of Maui and Kahoolawe, HI; Final Rule. 50 CFR Part 17, Federal Register 68(93)25933-26165.

Critical habitat was designated for *Nototrichium humile* in four units totaling 515 hectares (1,280 acres) on Oahu. This designation includes habitat on state and private lands. Critical habitat was not designated on U.S. Army land because active management of the area by the landowner outweighed any additional benefits from including that area as critical habitat (USFWS 2003a). In addition, 397 hectares (982 acres) were designated in one unit on Maui (USFWS 2003b).

1.3.4 Review History:

Species status review [FY 2006 Recovery Data Call (September 2006)]:
Stable

Recovery achieved:

1 (0-25%) (FY 2006 Recovery Data Call)

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

8

1.3.6 Current Recovery Plan or Outline

Name of plan or outline: Recovery plan for the Oahu plants. 1998. U.S. Fish and Wildlife Service, Portland, Oregon. 207 pages + appendixes.

Date issued: October 10, 1998

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?

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:

A synthesis of the threats (Factors A, D, and E) affecting this species is presented in section 2.4. Factors B (overutilization for commercial, recreational, scientific, or educational purposes) and C (disease or predation) are not known to be a threat to this species.

Stabilizing, downlisting, and delisting objectives are provided in the recovery plan for Oahu plants (USFWS 1998), based on whether the species is an annual, a short-lived perennial (fewer than ten years), or a long-lived perennial. *Nototrichium humile* is a short-lived perennial, and to be considered stable, the taxon must be managed to control threats (*e.g.*, fenced) and be represented in an *ex situ* (off-site) collection. In addition, a minimum of three populations should be documented on Oahu and Maui. 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 *Nototrichium humile* should be documented on Oahu and Maui. 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 *Nototrichium humile* should be documented on Oahu and Maui. 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

In addition to the status summary table below, information on the species' status and threats was included in the final critical habitat rule referenced above in section 1.3.3 ("Associated Rulemakings") above and in section 2.4 ("Synthesis") below, which also includes any new information about the status and threats of the species.

Status of *Nototrichium humile* from listing through 5-year review.

Date	No. wild inds	No. outplanted	Downlisting Criteria	Downlisting Criteria Completed?
1996 – listing	1500-3,000	0	All threats managed in all 5-7 populations	No
			Complete genetic storage	No
			5-7 pops with 300 mature individuals each	No
1998 – recovery plan	1,500-1,600	0	All threats managed in all 5-7 populations	No
			Complete genetic storage	No
			5-7 pops with 300 mature individuals each	No
2003 – critical habitat	775-995	0	All threats managed in all 5-7 populations	Partial
			Complete genetic storage	Minimal
			5-7 pops with 300 mature individuals each	No
2007 – 5-yr review	1,245	0	All threats managed in all 5-7 populations	Partial
			Complete genetic storage	Minimal
			5-7 pops with 300 mature individuals each	No

2.3.1 Biology and Habitat

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

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:

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

2.3.1.4 Taxonomic classification or changes in nomenclature:

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.):

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

2.3.1.7 Other:

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

2.3.2.1 Present or threatened destruction, modification or curtailment of its habitat or range:

2.3.2.2 Overutilization for commercial, recreational, scientific, or educational purposes:

2.3.2.3 Disease or predation:

2.3.2.4 Inadequacy of existing regulatory mechanisms:

2.3.2.5 Other natural or manmade factors affecting its continued existence:

2.4 Synthesis

At the time of listing, 1,500 to 3,000 individuals of *Nototrichium humile* were known in 11 populations on Oahu and one on Maui (USFWS 1996). The species now appears to be extirpated on Maui. The number of individuals has remaining relatively constant over time. Currently, 12 populations are known, totaling 1,245 individuals: 70 mature and 4 immature individuals at Kahanahaiki; 58 mature and 7 immature individuals at Kaimuhole and Palikea Gulch; 198 mature and 35 immature individuals at Kaluakauila; 138 mature and 5 immature individuals at Keawaula; 21 mature and 31 immature individuals at Keaau; 5 mature individuals at Keawapilau; 16 mature and 3 immature individuals at Makaha; 72 mature and 1 immature individuals at Makua; 5 mature individuals at Nanakuli; 224 mature and 5 immature individuals at Waianae Kai; 12 mature individuals at Kolekole; 12 mature individuals at Puu Kaua; 302 mature, 14 immature, and 7 seedlings at Punapohaku (U.S. Army 2006).

The habitat for *Nototrichium humile* is *Diospyros* (lama)-*Sapindus* (lonomea) lowland dry-mesic forest or in alien vegetation, on degraded native cliffs. On cliffs plants are

somewhat protected from cattle, feral ungulates, invasive alien weeds, and fire. Associated species vary between locations and include *Abutilon sandwicense* (no common name), *Alyxia stellata* (maile), *Artemisia australis* (hinahina kuahiwi), *Antidesma pulvinatum* (hame, haa), *Bidens cervicata* (kookoolau), *Bidens torta* (kookoolau), *Bobea* sp (ahakea), *Bonamia menziesii* (no common name (NCN)), *Canavalia* (awikiwiki), *Carex meyenii* (NCN), *Carex wahuensis* ((NCN), *Chamaesyce multiflora* (akoko), *Charpentiera ovata* (papala), *Chenopodium oahuense* (aheahea), *Diospyros hillebrandii* (lama), *Diospyros sandwicensis* (lama), *Dodonaea viscosa* (aalii), *Doodia kunthiana* (okupukupu), and *Dryopteris sandwicensis* (NCN), *Dubautia sherffiana* (naenae), *Elaeocarpus bifidus* (kalia), *Eragrostis grandis* (kawelu), *Erythrina sandwicensis* (wiliwili), *Euphorbia haeleleana* (NCN), *Hibiscus arnottianus* (kokio keokeo), *Kadua cordata* (kopa), *Lipochaeta lobata* var. *leptophylla* (nehe), *Lipochaeta tenuifolia* (nehe), *Lipochaeta tenuis* (nehe), *Lobelia niihauensis* (NCN), *Lysimachia hillebrandii* (kolokolo lehua), *Melicope* sp.(alani), *Metrosideros polymorpha* (ohia), *Microlepia strigosa* (palapalai), *Myoporum sandwicensis* (naio), *Myrsine lanaiensis* (kolea), *Neraudia angulata* (NCN), *Nestegis sandwicensis* (olopua), *Ochrosia* sp. (holei), *Osteomeles actinophylla* (ulei), *Panicum beecheyi* (NCN), *Peperomia* sp. (ala ala wai nui), *Phyllanthus distichus* (pamakani mahu), *Pilea peploides* (NCN), *Pipturus albidus* (mamaki), *Pisonia sandwicensis* (papala kepau), *Pisonia umbellifera* (papala kepau), *Plectranthus parviflorus* (la ala wai nui pua ki), *Pleomele forbesii* (halapepe), *Pouteria sandwicensis* (alaa), *Psychotria mariniana* (kopiko), *Psydrax odorata* (alaahee), *Rauvolfia sandwicensis* (hao), *Reynoldsia sandwicensis* (ohe), *Rumex albescens* (huahuako), *Sapindus oahuensis* (lonomea), *Schiedea hookeri* (NCN), *Schiedea ligustrina* (NCN), *Schiedea mannii* (NCN), *Sicyos* (anunu), *Sida fallax* (ilima), *Sophora chrysophylla* (mamane), *Stenogyne* sp. (NCN), *Streblus pendulinus* (aiiai), *Tetramolopium filiforme* (NCN), and *Viola chamissoniana* ssp. *chamissoniana* (pamakani, olopu) (National Tropical Botanical Garden 2007; Hawaii Biodiversity and Mapping Program 2005; Wood 2004).

Fire (Factor E) is the biggest threat to *Nototrichium humile*. Seventy percent of the known individuals occur within the action area for the Makua Military Reservation, with the majority (44 percent) found in the high fire risk zone (USFWS 2007). Road building, soil and rocks moved to side of road has resulted in covering plants and disturbing the original substrate at Palikea Gulch (Factor E). Feral pigs (*Sus scrofa*) and goats (*Capra hircus*) (Factors A and D) threaten this species by disturbing the habitat with digging and climbing, which cause erosion and landslides. The one plant left in Keaau Valley was heavily browsed by goats in 2003 (Factor C) (Hawaii Biodiversity and Mapping Program 2005). Invasive introduced plant species which degrade habitat for *Nototrichium humile* and compete for resources include *Ageratina adenophora* (pamakani haole), *A. riparia* (spreading mist flower), *Blechnum occidentale* (NCN), *Buddleia asiatica* (dog tail), *Caesalpinia decapetala* (wait-a-bit), *Cordyline fruticosa* (ti), *Erigeron* (fleabane), *Grevillea robusta* (silk oak), *Hyptis pectinata* (NCN), *Kalanchoe pinnatum* (air plant), *Lantana camara* (lantana), *Leucaena leucocephala* (koa haole), *Melia azedarach* (pride of India), *Melinis minutiflora* (molasses grass), *Pimenta dioica* (allspice), *Oplismenus hirtellus*

(basketgrass), *Panicum maximum* (guinea grass), *Passiflora suberosa* (huehue haole), *Psidium guajava* (common guava), *Psidium cattleianum* (strawberry guava), *Rivina humilis* (coral berry), *Salvia occidentalis* (West Indian sage), *Schefflera actinophylla* (octopus tree), *Schinus terebinthifolius* (Christmas berry), and *Syzygium cumini* (Java plum) (Factor E) (National Tropical Botanical Garden 2007).

Two populations are completely protected from feral ungulates, and three are partially protected. Invasive plant species are partially controlled in two populations. The U.S. Army has successfully grown plants from cuttings at the Pahole Nursery of for seven of the thirteen known populations. In 2006, they had 227 plants in the nursery (U.S. Army 2006). Seeds are in storage at National Tropical Botanical Garden and the Center for Conservation and Research Training's Seed Storage Laboratory (National Tropical Botanical Garden 2007; Center for Conservation and Research Training Seed Storage Laboratory 2007).

The stabilization and recovery goals for this species have not been met, since even though six populations have adequate numbers of mature individuals to meet the interim stability criteria, none have adequate numbers to meet downlisting criteria, and 44 percent of the individuals are in areas of high risk from fire as a result of military training. Therefore, *Nototrichium humile* meets the definition of endangered as it remains in danger of extinction throughout its range.

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:

- Develop fire management plans for the populations at high fire risk.
- Continue collection for *ex situ* genetic storage.
- Control introduced invasive plant species around populations.
- Fence populations to control feral pigs.
- Study *Nototrichium humile* 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.

5.0 REFERENCES:

Center for Conservation and Research Training Seed Storage Laboratory. 2007. Database Unpublished.

Hawaii Biodiversity and Mapping Program. 2005. Program Database. Unpublished.

Makua Implementation Team. 2003. Implementation Plan for the Makua Military Reservation, Island of Oahu. Prepared for U.S. Army Garrison, Hawaii, May 2003. Unpublished.

National Tropical Botanical Garden. 2007. Living Collections Database. Available online at <http://ntbg.org/conservation/database.php>.

[U.S. Army] U.S. Army Garrison, Hawaii. 2006. 2006 Status reports for the Makua implementation plan and the draft O`ahu implementation plan. Unpublished.

[USFWS] U.S. Fish and Wildlife Service. 2007. Reinitiation of the biological opinion of the U.S. Fish and Wildlife Service for military training at Makua Military Reservation. June 22, 2007. Unpublished.

[USFWS] U.S. Fish and Wildlife Service. 2003a. Endangered and threatened wildlife and plants; final designations or nondesignations of critical habitat for 101 plant species from the island of Oahu, Hawaii; final rule. Federal Register 68(116):35950-35993.

[USFWS] U.S. Fish and Wildlife Service. 2003b. Endangered and threatened wildlife and plants; designation of critical habitat for 60 plant species from the islands of Maui and Kahoolawe, HI; Final Rule. Federal Register 68(93)25933-26165.

[USFWS] U.S. Fish and Wildlife Service. 1998. Recovery plan for the Oahu plants. Portland, Oregon. 207 pages + appendixes.

[USFWS] U.S. Fish and Wildlife Service. 1996. Determination of endangered status for twenty-five plant species from the Island of Oahu, HI; final rule. Federal Register 61(198):53089-53108.

Wood, K.R. 2004. National Tropical Botanical Garden. Notes on *Nototrichium humile*. Unpublished.

Signature Page
U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW of *Nototrichium humile* (Kulu'i)

Current Classification: _____ E _____

Recommendation resulting from the 5-Year Review:

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

Appropriate Listing/Reclassification Priority Number, if applicable: _____

Review Conducted By:

Marilet A. Zablan, Recovery Program Leader and Acting Assistant Field Supervisor for Endangered Species, October 30, 2007

Marie Brueggemann, Plant Recovery Coordinator, September 5, 2007

Approve  Date 1/18/08
Lead Field Supervisor, Fish and Wildlife Service