

## **5-YEAR REVIEW**

Short Form Summary

**Species Reviewed:** *Nototrichium humile* (kului)

**Current Classification:** Endangered

### **Federal Register Notice announcing initiation of this review:**

[USFWS] U.S. Fish and Wildlife Service. 2010. Endangered and threatened wildlife and plants; initiation of 5-year status reviews of 58 species in Washington, Oregon, California, and Hawaii. Federal Register 75(226):71726-71729.

### **Lead Region/Field Office:**

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

### **Name of Reviewer(s):**

Jiny Kim, Fish and Wildlife Biologist, PIFWO

Daniel Clark, Oahu, Kauai, Northwest Hawaiian and American Samoa Islands Team Manager, PIFWO

Marie Brueggemann, Plant Recovery Coordinator, PIFWO

Recovery Program Lead, PIFWO

Kristi Young, Programmatic Deputy Field Supervisor, PIFWO

### **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 January 31, 2012. The review was based on a review of current, available information since the last 5-year review for *Nototrichium humile* (USFWS 2008). The National Tropical Botanical Garden provided an initial draft of portions of the five-year review and recommendations for conservation actions needed prior to the next five-year review. The document was reviewed by the Fish and Wildlife Biologist, Island Team Manager, and Plant Recovery Coordinator, followed by the Recovery Program Lead. It was subsequently reviewed and approved by the Programmatic Deputy Field Supervisor.

### **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](http://ecos.fws.gov/tess_public)).

### **Review Analysis:**

Please refer to the previous 5-year review for *Nototrichium humile* published on January 18, 2008 (available at <[http://ecos.fws.gov/docs/five\\_year\\_review/doc1857.pdf](http://ecos.fws.gov/docs/five_year_review/doc1857.pdf)>) for a complete review of the species' status, threats, and management efforts. No significant new information regarding the species' biological status has come to light since listing to warrant a change in the Federal listing status of *N. humile*.

This short-lived shrub is endangered and occurs on the island of Oahu. It has apparently been extirpated on the island of Maui. The current status and trends for are provided in the tables below.

New status information:

- More plants were found in a new site in Makaha during fence surveys in 2010 (U.S. Army Garrison 2010).
- Monitoring in 2012 showed a decline in the number of individuals in the Punapohaku population; however more immature plants were reported (Oahu Army Natural Resource Program [OANRP] 2012c).
- The Makua population declined from 63 to 52 individuals in 2012 (OANRP 2012c).
- Kahanahaiki showed no change in population size (78 individuals) (OANRP 2012c).
- Seedlings were not reported from any of the populations in 2012 (OANRP 2012c).

The total number of individuals of *Nototrichium humile* declined from 1,245 in the last five-year review to 1,021 currently.

New threats:

- Climate change - Climate change may pose a threat to this species. However, current climate change analyses in the Pacific Islands lack sufficient spatial resolution to make predictions on impacts to this species. The Pacific Islands Climate Change Cooperative (PICCC) funded climate modeling that will help resolve these spatial limitations. High spatial resolution climate outputs are expected in 2013.

New management actions:

- Ungulate exclosures
  - OANRP completed a fence around the *Nototrichium humile* population in the Waianae Kai Forest Reserve (U.S. Army Garrison 2008). In 2011, supplemental fencing was installed in the Waianae Kai to further protect *N. humile* there, and OANRP personnel are confident that goats can no longer penetrate this fence (U.S. Army Garrison 2011).
  - Kaluakauila is considered completely protected from ungulates (U.S. Army Garrison 2011).
- Invertebrate control research
  - In 2009, slug control research using Sluggo, a slug and snail bait, began in the field at the Kahanahaiki population on U.S. Army lands (U.S. Army Garrison 2009, 2010).
  - Monitoring of slug activity around *Nototrichium humile* commenced in 2010 and included traps baited with beer. Monitoring includes looking for signs of slug damage (U.S. Army Garrison 2010).
  - By applying slug bait around *Nototrichium humile*, OANRP hopes to determine if slug activity exceeds acceptable levels, and if so, then

maintain slug bait at sensitive plant populations (U.S. Army Garrison 2010).

- In October 2010, Sluggo was registered for use by the Hawaii Department of Agriculture (OANRP 2011) for control of slugs and nonnative snails in forested areas for the protection of native, threatened, and endangered plants of Hawaii. However, since native snails also exist in areas where threatened and endangered plants occur, additional research is needed to find a control method that can be used in areas where native snail species co-occur with listed plants to prevent non-target effects of treatment.
- Captive propagation for genetic storage and reintroduction:
  - OANRP (2012a) reported having 355 plants in their nursery in 2012.
  - OANRP (2012b) has completed genetic storage for 68 founder plants.
  - OANRP has continued to work with the Waimea Botanical Garden to maintain a collection of living clones of 27 plants from the Kahanahaiki population (U. S. Army Garrison 2008).
- Reintroduction / translocation - OANRP changed its designation of populations for *Nototrichium humile* from 14 in 2008 to seven in 2012 (U. S. Army Garrison 2008; OANRP 2012c).
- Fire protection - OANRP contracted the construction of a 35-acre fuel-break in the *Urochloa maximus* (Guinea grass) dominated fallow agriculture fields along Kaukonahua Road above Waialua for the second year in a row. This area is where a fire in August 2007 crossed the road before burning within a few meters of the plants in the Kaimuhole and Palikea populations of *Nototrichium humile* (U. S. Army Garrison 2010).

### **Synthesis:**

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.

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.

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.

The downlisting goals for *Nototrichium humile* have not been met, since no populations contain more than 300 mature individuals and there are no populations on Maui (Table 1). In addition, all threats not being sufficiently managed throughout the populations (Table 2). Therefore, *Nototrichium humile* meets the definition of endangered as it remains in danger of extinction throughout its range.

#### **Recommendations for Future Actions:**

- Captive propagation for genetic storage and reintroduction
  - Collect cuttings or seed from tagged individuals, keeping close track of the maternal source for use in *ex situ* propagation.
  - Continue to collect seeds from all existing populations and send to at least two or three different facilities for propagation and storage.
- Reintroduction / translocation
  - While surveying for new populations or reintroduced populations, determine which sites are least invaded by invasive introduced plant species and which appear to have the highest likelihood of maintaining new reintroductions.
  - Continue to reintroduce the species back into its known historical range.
- Ungulate exclosures – Construct and monitor ungulate-proof exclosures around each population.
- Ecosystem-altering invasive plant species control – Control invasive introduced plant species around all populations.
- Predator / herbivore control – Implement effective control methods for rodents.
- Surveys / inventories – Survey geographical and historical range for a thorough current assessment of the species status.
- Site / area / habitat protection – Develop and implement effective measures to reduce the impact of landslides, flooding and military activities.
- Fire protection – Develop and implement fire management plans for all wild and reintroduced populations.
- Alliance and partnership development - Initiate planning and contribute to implementation of ecosystem level restoration and management to benefit this taxon.
- Genetic research – Assess genetic variability within extant populations.
- Population biology research – 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.
- Threats research – Assess the modeled effects of climate change on this species, and use to determine future landscape needed for the recovery of the species.

**Table 1. Status and trends of *Nototrichium humile* from listing through current 5-year review.**

<b>Date</b>	<b>No. wild indivs</b>	<b>No. outplanted</b>	<b>Downlisting Criteria identified in Recovery Plan</b>	<b>Downlisting Criteria Completed?</b>
1996 (listing)	1,500-3,000	0	All threats managed in 5-7 populations	No
			Complete genetic storage	No
			5-7 populations with 300 mature individuals each	No
1998 (recovery plan)	1,500-1,600	8	All threats managed in 5-7 populations	No
			Complete genetic storage	No
			5-7 populations with 300 mature individuals each	No
2003 (critical habitat)	775-995	0	All threats managed in 5-7 populations	Partially
			Complete genetic storage	No
			5-7 populations with 300 mature individuals each	No
2008 (5-yr review)	1,245	0	All threats managed in 5-7 populations	Partially
			Complete genetic storage	Yes, partially
			5-7 populations with 300 mature individuals each	No
2013 (5-yr review)	1,021	6	All threats managed in 5-7 populations	Partially (see Table 2)
			Complete genetic storage	Partially
			5-7 populations with 300 mature individuals each	No

**Table 2. Threats to *Nototrichium humile* and ongoing conservation efforts.**

Threat	Listing factor	Current Status	Conservation/ Management Efforts
Ungulates – Degradation of habitat and herbivory	A, C, D	Ongoing	Partially
Established ecosystem-altering invasive plant species	A, E	Ongoing	Unknown
Slugs herbivory	C	Ongoing	Partially
Fire	A, E	Ongoing	Partially
Climate change	A, E	Increasing	No

**References:**

See previous 5-year review for a full list of references (USFWS 2008). Only references for new information are provided below.

[OANRP] Oahu Army Natural Resource Program. 2011. Special local needs registration for *Sluggo* approved in the state of Hawaii through 2015. Ecosystem Management Program Bulletin 52:1-8.

[OANRP] Oahu Army Natural Resources Program. 2012a. Army nursery summary. 1 page. Unpublished.

[OANRP] Oahu Army Natural Resources Program. 2012b. Genetic storage summary. 9 pages. Unpublished.

Oahu Army Natural Resources Program. 2012c. Makua implementation plan - population unit status; *Nototrichium humile*. 1 page. Unpublished.

U.S. Army Garrison. 2008. 2008 status report for the Makua implementation plan. U.S. Army Garrison, Hawaii and Pacific Cooperative Park Studies Unit. Schofield Barracks, Hawaii. 210 pages. Available online at [http://manoa.hawaii.edu/hpicesu/DPW/2008\\_YER/2008\\_YER\\_edited.pdf](http://manoa.hawaii.edu/hpicesu/DPW/2008_YER/2008_YER_edited.pdf).

U.S. Army Garrison. 2009. 2009 status report for the Makua and Oahu implementation plans. U.S. Army Garrison, Hawaii and Pacific Cooperative Park Studies Unit. Schofield Barracks, Hawaii. 711 pages. Available online at [http://manoa.hawaii.edu/hpicesu/DPW/2009\\_OIP/2009\\_OIP\\_Edited.pdf](http://manoa.hawaii.edu/hpicesu/DPW/2009_OIP/2009_OIP_Edited.pdf).

U.S. Army Garrison. 2010. 2010 status report for the Makua and Oahu implementation plans. U.S. Army Garrison, Hawaii and Pacific Cooperative Park Studies Unit. Schofield Barracks, Hawaii. 588 pages. Available online at [http://manoa.hawaii.edu/hpicesu/DPW/2010\\_YER/2010\\_YER\\_Edited.pdf](http://manoa.hawaii.edu/hpicesu/DPW/2010_YER/2010_YER_Edited.pdf).

U.S. Army Garrison. 2011. 2011 status report for the Makua and Oahu implementation plans. U.S. Army Garrison, Hawaii and Pacific Cooperative Park Studies Unit. Schofield Barracks, Hawaii. 269 pages. Available online at [http://manoa.hawaii.edu/hpicesu/DPW/2011\\_YER/2011\\_YER\\_Edited.pdf](http://manoa.hawaii.edu/hpicesu/DPW/2011_YER/2011_YER_Edited.pdf).

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

[USFWS] U.S. Fish and Wildlife Service. 2008. *Nototrichium humile* (kului) 5-year review summary and evaluation. U.S. Fish and Wildlife Service, Honolulu, Hawaii. 13 pages. Available online at [http://ecos.fws.gov/docs/five\\_year\\_review/doc1857.pdf](http://ecos.fws.gov/docs/five_year_review/doc1857.pdf).

**U.S. FISH AND WILDLIFE SERVICE**  
SIGNATURE PAGE for 5-YEAR REVIEW of *Nototrichium humile* (kului)

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

*acting deputy*  
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Date *2013-08-08*