

Tetramolopium filiforme
(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

Species reviewed: *Tetramolopium filiforme* (No common name)

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5-YEAR REVIEW
***Tetramolopium filiforme* (No common name)**

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 June 2007. The Hawaii Biodiversity and Mapping Program provided most of the updated information on the current status of *Tetramolopium filiforme*. They also provided recommendations for conservation actions that may be needed prior to the next five-year review. The evaluation of the lead PIFWO biologist was reviewed by the Plant Recovery Coordinator. These comments were incorporated into the draft five-year review. The document was then 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. 1991. 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 56(209):55770-55786.

Date listed: October 29, 1991
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. 2003. Endangered and threatened wildlife and plants; final designations or nondesignations of critical habitat for 101 plant species from the island of Oahu, HI; final rule. Federal Register 68(116):35950-36406.

Critical habitat was designated for *Tetramolopium filiforme* in one unit totaling 111 hectares (273 acres) on the island of Oahu. This designation includes habitat on state/local land in the Waianae Kai Forest Reserve. 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 2003).

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:

2

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 + appendices.

Date issued: October 10, 1998

Dates of previous revisions, if applicable: Recovery needs of *Tetramolopium filiforme* were originally addressed in the Waianae Mountains recovery plan (USFWS 1995). However, this plan was replaced by the more comprehensive Oahu recovery plan (1998).

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, B, C, D, and E) affecting this species is presented in section 2.4.

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. *Tetramolopium filiforme* 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. 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 *Tetramolopium filiforme* should be documented on Oahu. 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 *Tetramolopium filiforme* should be documented on Oahu. Each of these populations must be naturally reproducing, stable or increasing in number, and secure from threats, with 300 mature individuals per population. 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 I.C.5 ("Associated Rulemakings") and in section II.D ("Synthesis") below, which also includes any new information about the status and threats of the species.

Status of *Tetramolopium filiforme* from listing through 5-year review.

Date	No. wild inds	No. outplanted	Stability Criteria	Stability Criteria Completed?
1991 – listing	Fewer than 500	0	All threats managed in all 3 populations	No
			Complete genetic storage	No
			3 populations with 50 mature individuals each	No
1998 – recovery plan	1,550	0	All threats managed in all 3 populations	Partially
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	Partially
2003 – critical habitat	253	0	All threats managed in all 3 populations	Partially
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	Partially
2007 – 5-yr review	3,500	18	All threats managed	Partially
			Complete genetic storage	Partially
			3 pops with 50 mature individuals each	Partially

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

Tetramolopium filiforme is endemic to the northern Waianae Mountains of Oahu. At the time the species was listed, *Tetramolopium filiforme* was known from five populations in the northern Waianae Mountains totaling fewer than 500 individuals (USFWS 1991). At the time the first recovery plan was published, four populations remained, including Keaau Valley, Kahanahaiki Valley, Puu Kawiwi, and the Makua-Keaau Ridge on Federal and State land. These populations were estimated at approximately 1,500 individuals (USFWS 1995 and 1998). Currently, the majority of the known individuals of this species are on the portion of Ohikilolo Ridge within the boundaries of the U.S. Army's Makua Military Reservation. On the Makua Valley side of the ridge, 2,442 mature plants, 552 immature plants, and one seedling have been recorded. The portion of the Ohikilolo population that extends into Makaha consists of 300 mature plants. A second population occurs in Keaau Valley, and contains 30 mature plants, 41 immature plants, and 17 seedlings. A third population of *T. filiforme*, also in Makua Military Reservation, is found in Kahanahaiki Valley. This small population consists of only 45 mature plants. A fourth population of *T. filiforme* occurs in Waianae Kai Valley. Thirty mature plants, eight immature plants, and one seedling have been counted in Waianae Kai. A fifth, small population of *T.*

filiforme is located in Puhawai, the northernmost section of Luaualei Valley. The population is located near the Waianae summit ridge near Puukumakalii. When monitored in 2006, the plants at Puhawai numbered one mature plant, two immature plants, and three seedlings. A new population of *T. filiforme* consisting of nine mature individuals was discovered by U.S. Army staff in 2006 at Puukalena in West Range in Schofield Barracks Military Reservation. In total, 2,857 mature, 603 immature individuals, and 22 seedlings are known from the six populations. The numbers may have increased based on more thorough surveys, and not necessarily because the species is recovering. The U.S. Army staff has initiated one outplanting on Puhawai. A total of 28 plants were planted in February 2006 and by June 2006 a total of 18 plants had survived, with four of them flowering (U.S. Army 2006).

Two different varieties of this species are recognized. *Tetramolopium filiforme* var. *filiforme* has linear-filiform leaves with entire margin and *T. filiforme* var. *polyphyllum* has linear-oblongate leaves with coarsely dentate margins (Lowrey 1999). There is no clear dividing line in the distribution of two currently recognized varieties of *Tetramolopium filiforme* (Makua Implementation Team 2003). In the lowest, driest part of the Ohikilolo Ridge population, only *T. filiforme* var. *filiforme* is present. On the higher and wetter inland portions of the ridge, plants matching the descriptions of both varieties can be found, together with plants that appear morphologically intermediate between the two varieties (Makua Implementation Team 2003).

Tetramolopium filiforme habitat ranges from dry to mesic. The species grows on exposed rocky ridges and on sparsely vegetated cliffs, and is often rooted in cracks in the rock (Makua Implementation Team 2003; USFWS 2003). The elevation gradient for *T. filiforme* ranges from 247 to 978 meters (810 to 3,209 feet) (USFWS 2003).

Habitat degradation by feral goats (*Capra hircus*) is considered one of the major threats to *Tetramolopium filiforme* (Factors A and D) (USFWS 1991, 1998 and 2003; U.S. Army 2006). Feral pigs (*Sus scrofa*) represent less of a threat to *T. filiforme*, but their trampling and browsing degrades the habitat of *T. filiforme* (Factors A and D) (U.S. Army 2006). A fence completed in 2000 runs along the southern perimeter of Makua Valley, preventing feral goats from entering the valley from the adjacent valleys of Makaha and Keaau. Goats have been almost completely eradicated from *Tetramolopium filiforme* habitat on Ohikilolo Ridge within Makua Valley. However, goat sign was observed by U.S. Army staff in 2006 within the perimeter fence. Goats are not currently a threat to the small population in Kahanahaiki. Large numbers of goats are present on Ohikilolo Ridge outside the Makua Military Reservation in Makaha and Keaau Valleys. The part of Waianae Kai Valley that contains the known plants of *T. filiforme* also harbors large numbers of feral goats. However, these plant populations are to some extent protected from the goats, as many of these plants are on steep cliffs and cannot be reached by goats (U.S. Army 2006).

Trampling and collecting by humans on or near the trails is considered a threat for *T. filiforme* (Factor B) (USFWS 1991, 1998 and 2003). A potential threat identified for

this species includes nonnative insects, namely scale insects and the ants that tend them (Factor C) (Makua Implementation Team 2003). Habitat degradation by, and competition from, invasive introduced plant species poses a major threat to the species. Invasive introduced plant species that threaten *T. filiforme* include *Erigeron karvinskianus* (daisy fleabane), *Leucaena leucocephala* (koa haole), *Melinis minutiflorus* (molasses grass), *Acacia confusa* (formosan koa), *Argemone riparia* (spreading mistflower), *Kalanchoe pinnata* (air plant), *Lanana camara* (lantana), and *Schinus terebinthifolius* (Christmas berry) and *Panicum maximum* (guineagrass) (Factor E) (USFWS 1991, 1998 and 2003; U.S. Army 2006).

Fire is a threat to *Tetramolopium filiforme* (Factor E). Fires have burned into the lowest reaches of the Ohikilolo Ridge population in Makua (Makua Implementation Team 2003). The July 2003 fire in Makua Military Reservation burned to within 20 meters of the *T. filiforme* site in Kahanahaiki. The population is now buffered by only a small strip of forest and subsequent fires could eliminate this population. U.S. Army staff may begin controlling the tall non-native grass *Panicum maximum* (guineagrass) in the forest next to the *T. filiforme* site to reduce the fuel load in the area (U.S. Army 2006).

In addition to all of the other threats, species like *Tetramolopium filiforme* that are endemic to a small portion of a single island, and limited to a few populations and individuals, are inherently more vulnerable to extinction than widespread species because of the higher risks posed by random demographic fluctuations and localized catastrophes such as hurricanes and disease outbreaks (Factor E).

Through genetic storage, the U.S. Army is helping to address the threat associated with a small number of populations and small population sizes. Propagation for genetic storage and reintroduction is occurring at the Army's baseyard, the University of Hawaii's Lyon Arboretum Micropropagation and Seed Storage Laboratories, National Tropical Botanical Garden, the State of Hawaii's Division of Forestry and Wildlife's Pahole Rare Plant Facility, and at 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 (U.S. Army 2006; Makua Implementation Team 2003).

Four populations of *Tetramolopium filiforme* are scheduled to be managed for interim stability by the U.S. Army, as defined in the recovery criteria for the species. The populations scheduled for such management are on the northern side of Ohikilolo Ridge in Makua Valley; in Waianae Kai; at Puukalena; and in the Puukumakalii area, including the wild plants in Puhawai. The other populations of *T. filiforme* will be managed for collection of propagules for long-term genetic storage in *ex situ* collections (U.S. Army 2006). The plan for the management of the population in the Puukumakalii-Puhawai area calls for outplantings of Puhawai stock at sites on the windward side of the summit ridge on U.S. Army-owned land. U.S. Army staff has initiated one of these outplantings. Twenty-eight mature cultivated plants of Puhawai

stock were outplanted in February 2006. When monitored in June 2006, 18 plants had survived and four of them were flowering (U.S. Army 2006).

The stabilization and recovery goals for this species have not been met, as only two populations have numbers above interim stability, and all of the threats are not yet managed in any of the populations. In addition, all but approximately 150 of the individuals occur on military land and 30 percent occur in areas at high fire risk from military training. Therefore, *Tetramolopium filiforme* 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:

- Continue seed collection for *ex situ* genetic storage and reintroduction.
- Control introduced invasive plant species around wild plants.
- Fence areas to eliminate feral pigs and goats.
- Study *Tetramolopium filiforme* 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.

- Study the genetic and morphological variation within *Tetramolopium filiforme* and examine the taxonomic validity of the two currently recognized varieties of the species. Investigate the possible past and/or present occurrence of introgression between *T. filiforme* and the other *Tetramolopium* species still extant in the Waianae Mountains, *T. lepidotum*.

5.0 REFERENCES:

Lowrey, T.K. 1999. *Tetramolopium* Ness. Pages 361-369 in Wagner, W.L., D.R. Herbst, and S.H. Sohmer (editors), Manual of the flowering plants of Hawai'i. Bishop Museum, Revised Edition. University of Hawai'i Press, Bishop Museum Press, Special Publication. 97:1-1918.

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

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Signature Page
U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW of *Tetramolopium filiforme* (No common name)

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, June 27, 2007

Marie Bruegmann, Plant Recovery Coordinator, May 30, June 11 and 29, 2007

Christian Torres-Santana, Fish and Wildlife Biologist, April 26, 2007

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