Gouania vitifolia
(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
Gouania vitifolia (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 *Gouania vitifolia*. 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:

Improving (FY 2006 Recovery Data Call)

3. Recovery achieved:

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

4. Listing history

Original Listing

FR notice: U.S. Fish and Wildlife Service. 1994. Endangered and threatened wildlife and plants; endangered status for three plants from the Waianae Mountains, island of Oahu, Hawaii. *Federal Register* 59(122): 32932-32938.
Date listed: June 27, 1994
Entity listed: Species
Classification: Endangered

Revised Listing, if applicable
N/A

5. Associated actions:
Critical habitat was designated for *Gouania vitifolia* in one unit totaling 1,198 acres (ac) (486 hectares (ha)) on Maui; in eight units totaling 1,379 ac (559 ha) on Oahu; and in one unit totaling 4,412 ac (1,785 ha) on the island of Hawaii (68 FR 25933; 68 FR 35949; 68 FR 39623).

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

7. Species' Recovery Priority Number at start of review: 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).

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?
__X__ *Yes*
____ *No*

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

   _X_ *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)?**

   _X_ *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. *Gouania vitifolia* 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 Oahu, and, if possible, at least one other island 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 *Gouania vitifolia* should be documented on Oahu and at least one other island where they now occur or occurred historically. In certain cases, a particular taxon may be eligible for downlisting even if all five to seven of the populations are on only one island, provided all of the other recovery criteria have been met and the populations in question are widely distributed and secure enough that one might reasonably conclude that the taxon is not in danger of extinction throughout all or a significant part of its range. Each of these populations must be naturally reproducing, stable or increasing in number, and secure

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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) Inadqequacy of existing regulatory mechanisms;
E) Other natural or manmade factors affecting its continued existence.

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.

For delisting, a total of 8 to 10 populations of *Gouania vitifolia* should be documented on Oahu and at least one other island where it now occurs or occurred historically. As with downlisting, there may be certain cases in which a particular taxon may be eligible for delisting even if all eight to ten of the populations are on only one island, provided all of the other recovery criteria have been met and the populations in question are widely distributed and secure enough that one might reasonably conclude that the taxon is not in danger of extinction throughout all or a significant part of its range. 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, *Gouania vitifolia* was known from the islands of Oahu, Maui, and Hawaii. It was first collected on Oahu in the Waianae mountains in 1840 by Asa Gray. The Maui island population was discovered above Lahaina in the 1870s by Edward Bishop. A collection from the Kau district of Hawaii was made by Jules Remy in 1853. In 1994, when *Gouania vitifolia* was listed, there were two known populations on Waianae Kai ridge in the Waianae mountains on Oahu (59 FR 32932). In 1998, when the Recovery Plan was published, this species was known on Oahu from a single population of 8 individuals on Waianae Kai ridge, and from 2 populations totaling 18 individuals at the Manuka Natural Area Reserve (Manuka NAR) on the island of Hawaii (Service 1998). In 2003 *G. vitifolia* was extant on the islands of Oahu and Hawaii. The 2 populations in the Waianae mountains totaled 44 individuals. The numbers decreased in 2005 from drought. Currently, there are 2 populations on Oahu, one of 56 individuals at Keaau, and another of 2 to 8 individuals at Waianae Kai. At Waianae Kai and Manuka NAR it is difficult to estimate the exact number of plants since the vines form extensive tangled patches, whereas at Keaau the plants occur as scattered individuals (A. Bakutis, Genetic Safety Net, pers. comm. 2006; Hawaii Biodiversity and Mapping Program (HBMP) 2006; Service 1998). On the island of Hawaii, *G. vitifolia* is found at Manuka NAR in two separate populations, with individuals numbering in the tens (L. Perry, Division of Forestry and Wildlife, pers. comm. 2006). The number of genetically distinct clones represented by the individual plants of *G. vitifolia*, particularly at Waianae Kai and Manuka, is unknown since the species often reproduces vegetatively through the rooting of stems that contact the ground (J. Lau, Hawaii Biodiversity and Mapping Program, pers. comm. 2006).

Habitat degradation by feral pigs (*Sus scrofa*) is considered one of the major threats to *Gouania vitifolia* (Factor A) (Service 1998; J. Lau, pers. comm. 2006; 68 FR 35949). 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, Maui, and Hawaii, 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.* 1999). Feral pigs threaten a portion of the Manuka NAR population on the island of Hawaii; a portion of the population has been included within a pig-free exclosure constructed by the state of Hawaii's Division of Forestry and Wildlife (L. Perry, pers. comm. 2006). The Oahu populations of *G. vitifolia* are also threatened by feral pigs. Under the terms of the 1999 and 2001 Biological Opinions of the U.S. Fish and Wildlife Service for Routine Military Training at Makua Military Reservation, island of Oahu, the subsequent reinitiation of the Biological Opinion in 2004, and recent realignment of the defined action area at Makua Military Reservation; the Army may expedite stabilization measures for *G. vitifolia*. The Army already plans to construct an exclosure at the Keaau population in 2009, and small exclosures in the Waianae Kai area in 2011 (U.S. Army 2005).

Fire is considered a potential threat to *Gouania vitifolia*, as this species occurs in dry and mesic forests, which often become very dry in the summer months, and *G. vitifolia* is not considered fire tolerant (Factor A) (Service 1998; 68 FR 35949). One of the potential sources of fire at the Keaau population of *G. vitifolia* is from military training activities in the Makua Military Reservation. The Army has addressed the threat of fire from their training activities 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 2005; Makua Implementation Team 2003). The Army is also conducting fuel modification actions along the ridgeline between the Kaluakauila management unit (near the Keaau population) and the installation boundary to reduce the risk of fire in this area (Service 2004). The fire threat to the Keaau population of *G. vitifolia* is considerably higher than to the Waianae Kai and Manuka NAR populations due to the significantly drier conditions at Keaau, and the dominance of tall nonnative grass in the forest understory. Also, fires ignited through arson are frequent in the drier parts of the leeward side of the Waianae mountains where the Keaau population is located. Army staff plan to manage at least three populations of *G. vitifolia* on Oahu, including the population at Keaau (K. Kawelo, U.S. Army Environmental Division, pers. comm. 2006).

Feral goats (*Capra hircus*) also threaten *G. vitifolia* populations on Oahu (A. Bakutis, pers. comm. 2006) (Factors A and C). The goat, a species originally native to the Middle East and India, was successfully introduced to the Hawaiian Islands in 1792. Goats browse on introduced

grasses and native plants, especially in drier and more open ecosystems. 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). Feral goat sign has been observed at the Keaau population of *G.vitifolia*, but so far no evidence of direct browsing has been seen (A. Bakutis, pers. comm. 2006). Feral goats are also present in the general area of the *G. vitifolia* population in Waianae Kai (J. Lau, pers. comm. 2006). The Army plans construction of exclosures at Keaau in 2009 and at Waianae Kai in 2011 (U.S. Army 2005).

Gouania vitifolia is threatened by competition from and habitat degradation by nonnative plant species (Factors A and C) (59 FR 32932; 68 FR 35950; Natural Area Reserves System Program 1992). At the time of listing the primary nonnative plants impacting *G. vitifolia* were *Psidium cattleianum* (strawberry guava) and *Schinus terebinthifolius* (Christmas berry). The 1998 Recovery Plan included threats from the nonnative plants *Passiflora suberosa* (huehue haole) on Oahu, and *Psidium guajava* (common guava), *Passiflora ligularis* (sweet granadilla), and *Passiflora tarminiana* (banana poka) on the island of Hawaii. Currently, at Keaau the most common invasive nonnative plant species include *Hyptis pectinata* (comb pectis), *Leucaena leucocephala* (koa haole), and *Panicum maximum* (Guinea grass). *Panicum maximum* has become the dominant groundcover throughout the area and its contribution to the fuel load greatly increases the risk of fire to the *G. vitifolia* population (J. Lau, pers. comm. 2006). At Waianae Kai, the predominant invasive nonnative plants include *Aleurites moluccana* (kukui), *Buddleia asiatica* (dog tail), *Cordyline fruticosa* (ti), *Lantana camara* (lantana), *Oplismenus hirtellus* (basketgrass), *Passiflora edulis* (lilikoi), *Passiflora ligularis* (lemiwai), *Passiflora suberosa* (huehue haole), *Psidium guajava*, *Rubus argutus* (prickly Florida blackberry), and *Schinus terebinthifolius* (HBMP 2006). At the Manuka NAR population of *G. vitifolia*, the primary invasive nonnative plant species include *Paspalum conjugatum* (Hilo grass), *Passiflora ligularis, Passiflora mollisima* (banana poka), *Psidium guajava*, *Senecio mikanioides* (German ivy), and *Schinus terebinthifolius* (HBMP 2006; L. Perry, pers. comm. 2006; K. Wood, National Tropical Botanical Garden, pers. comm. 2006). The Army will conduct weed control at the Keaau and Waianae Kai exclosures, and Manuka NAR has a management plan in place that dictates control of priority weeds in intact communities of the reserve, extending to prevention of expansion of weeds as necessary (Natural Area Reserves System Program 1992).

Gouania vitifolia is threatened by random extinction and reduced reproductive vigor due to the small number of extant individuals, all of which may be genetically identical (Factor E). This species is included in the Oahu Genetic Safety Net program. The goal of this program is to secure and safeguard representative genetic material of the rarest of Hawaii's rare plants, either through the maintenance of living collections or through long-term storage of viable propagules. Collection of *G. vitifolia* propagules for Genetic Safety Net program purposes was initiated in 2005 (A. Bakutis, pers. comm. 2006). The species is a woody perennial vine, and is reportedly dioecious, producing male and female flowers on separate plants (Wagner *et al.* 1999), however this may not be completely so since in at least one case an isolated cultivated plant was able to produce fertile seed (J. Lau, pers. comm. 2006). Flowering and fruiting is common in the Keaau population. Flowering occurs primarily during the wet season, generally October through April, and the fruits usually mature in January through June. At Waianae Kai, *Gouania vitifolia*

flowers abundantly every year, yet fruiting has never been reported since the plants were discovered in 1991 (J. Lau, pers. comm. 2006). The Manuka NAR *G. vitifolia* plants have been found fruiting on occasion (L. Perry, pers. comm. 2006). Even though the Waianae Kai plants flower abundantly every year, fruiting has never been reported (J. Lau, pers. comm. 2006). The Keaau plants, which grow in a dry forest, typically lose their leaves and become dormant in the dry summer season, unlike plants at the wetter Waianae Kai and Manuka NAR sites (J. Lau, pers. comm. 2006). Individuals of the Keaau stock of *G. vitifolia* have been in cultivation for several years at various locations (J. Lau, pers. comm. 2006). Two cuttings from Manuka NAR plants have successfully been rooted at the National Tropical Botanical Garden (S. Perlman, National Tropical Botanical Garden, pers. comm. 2006), but other attempts at propagating the Manuka NAR stock through seeds and cuttings have failed (L. Perry, pers. comm. 2006). The Waianae Kai plants have never been observed to fruit, and attempts at vegetative propagation have not yet been successful (J. Lau, pers. comm. 2006; N. Sugii, Lyon Arboretum, pers. comm. 2006).

The goals for genetic storage *G. vitifolia* have been partially met for only one population. The stabilization, downlisting, and recovery goals for this species have not been met and, therefore, *G. vitifolia* 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
__X_ No, no change is needed

B. New Recovery Priority Number __NA___

IV. RECOMMENDATIONS FOR FUTURE ACTIONS

- Determine the number of genetically distinct clones in the populations of *Gouania vitifolia*, and the distribution of the clones within the populations. Use the results of the analyses to achieve goals for full genetic representation in *ex situ* genetic storage of each *G. vitifolia* population.

- Study *Gouania vitifolia* with regard to population size and structure, geographical distribution, breeding system, flowering cycles, pollination vectors, seed dispersal agents, longevity, specific environmental requirements, limiting factors, and threats.

- Develop and implement a plan for the prevention and suppression of fire at the Keaau *Gouania vitifolia* population.

V. REFERENCES

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

Current Classification __Endangered__

Recommendation resulting from the 5-Year Review

Downlist to Threatened
Uplist to Endangered
____ **Delist**
_X__ **No change is needed**

Appropriate Listing/Reclassification Priority Number _N/A__

Review Conducted By

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