

*Hibiscadelphus woodii*  
(Hau kuahiwi)

**5-Year Review  
Summary and Evaluation**

**U.S. Fish and Wildlife Service  
Pacific Islands Fish and Wildlife Office  
Honolulu, Hawaii**

**5-YEAR REVIEW**  
***Hibiscadelphus woodii* (Hau kuahiwi)**

**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 *Hibiscadelphus woodii*. 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:**

Declining (FY 2006 Recovery Data Call)

**3. Recovery achieved:**

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

**4. Listing history**

Original Listing

FR notice: U.S. Fish and Wildlife Service. 1996. Endangered and threatened wildlife and plants; determination of endangered or threatened status for nineteen plant species from the island of Kauai, Hawaii. *Federal Register* 61(198): 53070-53089.

Date listed: October 10, 1996

Entity listed: Species

Classification: Endangered

Revised Listing, if applicable

N/A

**5. Associated actions:**

Critical habitat was designated for *Hibiscadelphus woodii* in two units totaling 177 acres (72 hectares) on Kauai (U.S. Fish and Wildlife Service. 2003.

Endangered and threatened wildlife and plants; final designations or nondesignations of critical habitat for 95 plant species from the islands of Kauai and Niihau, HI. *Federal Register* 68(39): 9115-9179).

**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: Kauai II Addendum to the Recovery Plan for the Kauai Plant Cluster. 1998. U.S. Fish and Wildlife Service, Portland, Oregon. 84 pp., plus appendices.

Date issued: August 23, 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 ungulates; 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 landslides).

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

Stabilizing, downlisting, and delisting objectives are provided in the Kauai II Addendum to the Recovery Plan for the Kauai Plant Cluster (Service 1998), based on whether the species is an annual, a short-lived perennial (fewer than 10 years), or a long-lived perennial. *Hibiscadelphus woodii* is a long-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 Kauai where the species now occurs or occurred historically. Each of these populations must be naturally reproducing and increasing in number, with a minimum of 25 mature individuals per population.

This recovery objective has not been met.

For downlisting, a total of five to seven populations of *Hibiscadelphus woodii* should be documented on the island of Kauai 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 100 mature individuals per population. Each population should persist at this level for a minimum of 5 consecutive years before downlisting is considered.

- 
- 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.

This recovery objective has not been met.

For delisting, a total of 8 to 10 populations of *Hibiscadelphus woodii* should be documented on the island of Kauai 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 100 mature individuals per population for long-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

*Hibiscadelphus woodii* was first discovered in 1991, when four individuals were found on the cliff walls of Kalalau Valley, north of Kahuamaa Flats, on the island of Kauai. It was described in 1995 by David Lorence and Warren Wagner (Lorence and Wagner 1995). These individuals were extant when the species was listed in 1996 (61 FR 53070). It was discovered that three of the individuals were impacted by a fallen boulder leaving one plant dead and two showing signs of dieback (Wood *et al.* 2001). In 2001, only two individuals were remaining (Wood *et al.* 2001). Currently there is a single known individual remaining (K. Wood, National Tropical Botanical Garden, pers. comm. 2006).

Habitat degradation by feral goats and pigs is a threat to *Hibiscadelphus woodii* (Factor A). 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 Kauai 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). 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). The remaining *H. woodii* individual is located on a cliff wall, and due to the steep and difficult terrain, fencing or other activities could cause erosion or landslides that may impact the plant (Wood *et al.* 2001).

*Hibiscadelphus woodii* is threatened by alien plant species which compete with and degrade habitat of natives for space, light, water, and nutrients (Factors A and E) (Cuddihy and Stone 1990). The nonnative plant species *Erigeron karvinskianus* (daisy fleabane) is a threat to *H. woodii*, as it is a low-growing species that smothers native plants, particularly on cliffs (Service 1998).

*Hibiscadelphus woodii* is threatened by the nectar-robbing Japanese white-eye (*Zosterops japonicus*) (Factor A). Nectar robbing has the potential to be highly damaging to the reproductive success of *H. woodii* (Wood *et al.* 2001). Nitidulidae beetles were observed in a preserved flower specimen of *H. woodii*. It was proposed that the beetles may be responsible for the observed lack of fruit set (Wood *et al.* 2001).

In addition to all of the other threats, species like *Hibiscadelphus woodii* that are endemic to small portions 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).

*Hibiscadelphus woodii* fruits have never been observed to set seed (Factor E). A sample of *H. woodii* pollen was found to be non-viable when tested. Another possible factor for lack of seed set may be due to predation on the species' flowers and fruit by insects (Wood *et al.* 2001). There are no individuals of *H. woodii* in cultivation, nor any tissue of the species in *in vitro* culture (S. Perlman, National Tropical Botanical Garden, pers. comm. 2006; K. Wood, pers. comm. 2006). Vegetative propagation attempts have included air-layering, cuttings, grafts, and tissue culture, none of which have been successful (Wood *et al.* 2001; K. Wood pers. comm. 2006).

The stabilization and recovery goals for *Hibiscadelphus woodii* have not been met and, therefore, *H. woodii* 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

- Since the extinction of *Hibiscadelphus woodii* may be imminent, with only a single known individual remaining, and with no representation of the species in *ex situ* culture, it is imperative to redouble efforts to bring the species into cultivation or tissue culture by utilizing the skills of expert plant propagators, and by experimenting with innovative plant propagation techniques.
- Aerial hunting would reduce the number of ungulates, decreasing the rate of habitat degradation.
- Search for new individuals of *Hibiscadelphus woodii*.

#### V. REFERENCES

- Clarke, G. and L.W. Cuddihy. 1980. A Botanical Reconnaissance of the Na Pali Coast Trail: Kee Beach to Kalalau Valley (April 9-11, 1980). Division of Forestry and Wildlife, Department of Land and Natural Resources, Hilo, Hawaii.
- Cuddihy, L.W. and C.P. Stone. 1990. Alteration of native Hawaiian vegetation: effects of humans, their activities and introductions. Coop. Natl. Park Resources Studies Unit, University of Hawaii, Honolulu. 138 pp.
- Culliney, J.L. 1988. Islands in a Far Sea: Nature and Man in Hawaii. Sierra Club Books, San Francisco. 410 pp.
- Lorence, David H. and Warren L. Wagner. 1995. Another new, nearly extinct species of *Hibiscadelphus* (Malvaceae) from the Hawaiian Islands. *Novon* 5: 183-187.
- Medeiros, A.C., *et al.* 1986. Status of native flowering plant species on the south slope of Haleakala, East Maui, Hawaii. Coop. Natl. Park Resources Studies Unit, University of Hawaii, Honolulu. 230 pp.
- Scott, J.M., *et al.* 1986. Forest bird communities of the Hawaiian Islands: their dynamics, ecology, and conservation. *Studies in Avian Biology* 9:1-429.
- Smith, C.W. 1985. Impact of alien plants on Hawaii's native biota. In Hawaii's Terrestrial Ecosystems: Preservation and Management, Stone, C.P. and J.M. Scott, eds., Coop. Natl. Park Resources Studies Unit, University of Hawaii, Honolulu. pp. 180-250.
- Stone, C.P. 1985. Alien animals in Hawaii's native ecosystems: toward controlling the adverse effects of introduced vertebrates. In Hawaii's Terrestrial Ecosystems: Preservation and Management, Stone, C.P. and J.M. Scott, eds., Coop. Natl. Park Resources Studies Unit, University of Hawaii, Honolulu. pp. 251-297.

- Tomich, P.Q. 1986. Mammals in Hawaii: a Synopsis and Notational Bibliography. Bishop Museum Press, Honolulu. 375 pp.
- U.S. Fish and Wildlife Service. 1996. Endangered and Threatened Wildlife and Plants; Determination of Endangered or Threatened Status for Nineteen Plant Species from the Island of Kauai, Hawaii. Federal Register 61(198): 53070-53089.
- U.S. Fish and Wildlife Service. 1998. Kauai II Addendum to the Recovery Plan for the Kauai Plant Cluster, Portland, Oregon. 84 pp. + appendices
- van Riper, S.G. and C. van Riper. 1982. A Field Guide to the Mammals in Hawaii. The Oriental Publishing Company, Honolulu. 68 pp
- Wagner, W.L. *et al.* 1999. The Manual of the Flowering Plants of Hawaii, Revised Edition. University of Hawaii Press and Bishop Museum Press. 1,919 pp.
- Wood, K. R., S. Perlman, M. Chapin, and M. Maunder. 2001. Interim Report on Field Research conducted under USFWS Grant No. 122000G001 for Critically Endangered Hawaiian Plant Taxa and Conservation Collections within the Genetic Safety Net (GSN). August 2001.

#### **EXPERTS CONSULTED**

- Perlman, Steve. 2006. National Tropical Botanical Garden. Personal communication.
- Wood, Kenneth. 2006. National Tropical Botanical Garden. Personal communication.

**U.S. FISH AND WILDLIFE SERVICE**  
**5-YEAR REVIEW of *Hibiscadelphus woodii* (Hau kuahiwi)**

Current Classification Endangered

Recommendation resulting from the 5-Year Review

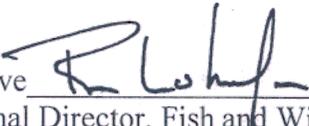
- Downlist to Threatened
- Uplist to Endangered
- Delist
- No change is needed

Appropriate Listing/Reclassification Priority Number N/A

Review Conducted By:

Gina Shultz, Assistant Field Supervisor for Endangered Species  
Marilet A. Zablan, Recovery Program Leader  
Marie Bruegmann, Plant Recovery Coordinator  
Cheryl Phillipson, Fish and Wildlife Biologist

 Date JUL - 3 2007  
Field Supervisor, Fish and Wildlife Service

Approve  Date Aug 2 2007  
Regional Director, Fish and Wildlife Service