CANDIDATE ASSESSMENT AND LISTING PRIORITY ASSIGNMENT FORM

SCIENTIFIC NAME: *Cyanea kunthiana*

COMMON NAME: Haha

LEAD REGION: Region 1

INFORMATION CURRENT AS OF: February 2003

STATUS/ACTION (Check all that apply):
___ New candidate
_X_ Continuing candidate
    _X_ Non-petitioned
    ___ Petitioned - Date petition received: ___
        __ 90-day positive - FR date: ___
        __ 12-month warranted but precluded - FR date: ___
        __ Is the petition requesting a reclassification of a listed species?
    ___ Listing priority change
        Former LP: ___
        New LP: ___
Latest date species first became a Candidate: _____
___ Candidate removal: Former LP: ___ (Check only one reason)
    ___ A - Taxon more abundant or widespread than previously believed or not subject to a degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status.
    ___ F - Range is no longer a U.S. territory.
    ___ M - Taxon mistakenly included in past notice of review.
    ___ N - Taxon may not meet the Act's definition of "species."
    ___ X - Taxon believed to be extinct.

ANIMAL/PLANT GROUP AND FAMILY: Plant, Campanulaceae (Bellflower family)

HISTORICAL STATES/TERRITORIES/COUNTRIES OF OCCURRENCE: Hawaii, island of Maui

CURRENT STATES/COUNTIES/TERRITORIES/COUNTRIES OF OCCURRENCE: Hawaii, island of Maui

LEAD REGION CONTACT (Name, phone number): Scott McCarthy, 503-231-6131

LEAD FIELD OFFICE CONTACT (Office, name, phone number): Pacific Islands (Ecological Services), Christa Russell, 808-541-3441

BIOLOGICAL INFORMATION (Describe habitat, historic vs. current range, historic vs. current population estimates (# populations, #individuals/population), etc.):

The historic range of *Cyanea kunthiana* was wet forest on the island of Maui. While there are no historic records of numbers of populations or individuals, qualitative accounts indicate that the species was not uncommon. Currently, this species is declining throughout its range and is known from approximately 20 populations totaling approximately 500 individuals (Arthur C. Medeiros III, Biological Resources Division, U.S. Geological Survey, pers. comm., 1996; Steve Perlman, National Tropical Botanical Garden, pers. comm., 1996; Hank Oppenheimer, Maui Land and Pineapple, pers. comm., 1999).

THREATS (Describe threats in terms of the five factors in section 4 of the ESA providing specific, substantive information. If this is a removal of a species from candidate status or a change in listing priority, explain reasons for change):

A. The present or threatened destruction, modification, or curtailment of its habitat or range.
Cyanea kunthiana is highly threatened by feral pigs that adversely modify habitat (A. Medeiros III, pers. comm., 1996, S. Perlman, pers. comm., 1996). 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. Past and present activities of introduced alien mammals are the primary factor altering and degrading vegetation and habitats on Maui. Feral ungulates trample and eat native vegetation and disturb and open areas. This causes erosion and allows the entry of alien plant species (Cuddihy and Stone 1990; Wagner *et al*. 1990).

The pig (*Sus scrofa*) is originally native to Europe, northern Africa, Asia Minor, and Asia. European pigs, introduced to Hawaii by Captain James Cook in 1778, became feral and invaded forested areas, especially wet and mesic forests and dry areas at high elevations. They are currently present on Maui and five other islands, and inhabit rain forests and grasslands. Pig hunting is allowed on all islands either year-round or during certain months, depending on the area (Hawaii, Department of Land and Natural Resources n.d.-a, n.d.-b, n.d.-c). 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. Pigs are a major vector in the spread of many introduced plant species (Cuddihy and Stone 1990; Medeiros *et al*. 1986; Scott *et al*. 1986; Smith 1985; Stone 1985; Tomich 1986; Wagner *et al*. 1990).

B. Overutilization for commercial, recreational, scientific, or educational purposes.

None known.

C. Disease or predation.

Of the ungulates introduced to Maui, pigs are currently the most significant modifiers of native forests (Cuddihy and Stone 1990; Stone 1985). Not only do they destroy native vegetation through their rooting activities and dispersal of alien plant seeds (see A), but pigs also feed on plants, preferring the pithy interior of large tree ferns and fleshy-stemmed plants from the bellflower family (Stone 1985; Stone and Loope 1987). Although there is no conclusive evidence of predation on *Cyanea kunthiana*, these plants are not known to be unpalatable. Direct predation by pigs is a possible threat to this species in areas where pigs have been reported.

Rats and slugs are a major threat to members of the bellflower family in Hawaii, of which this species is a member. They will eat any portion of the plant, and have been documented completely removing all leaves from plants (Joel Lau, The Nature Conservancy, pers. comm., 1994).

Of the four species of rodents that have been introduced to the Hawaiian Islands, the species with the greatest impact on the native flora and fauna is probably *Rattus rattus* (black or roof rat), that now occurs on all the main Hawaiian Islands around human habitations, cultivated fields, and forests. Black rats, and to a lesser extent *Mus musculus* (house mouse), *Rattus exulans* (Polynesian rat), and *R. norvegicus* (Norway rat), eat the fruits of some native plants, especially those with large, fleshy fruits. Many native Hawaiian plants produce fruit over an extended period of time, thus producing a prolonged food supply for rodent populations. Black rats strip bark from some native plants, and eat the fleshy stems and fruits of plants in the bellflower and African violet families (Cuddihy and Stone 1990; Tomich 1986; Joel Lau, The Nature Conservancy, pers. comm., 1994). Rat damage to the stems of species of *Cyanea* has been reported in the wet forests of Kauai. Rat damage has not been directly observed on *Cyanea kunthiana*, however, it is probable that rats eat the fruits of this species (Loyal Mehrhoff, *Service, in litt*. 1994).

Little is known about the predation of certain rare Hawaiian plants by slugs. Indiscriminate predation by slugs on plant parts of the related *Cyanea remyi* has been observed by field botanists (L. Mehrhoff, *in litt*. 1994; S. Perlman, pers. comm., 1994). The effect of slugs on the decline of this and related species is unclear, although slugs may pose a threat by feeding on the stems and fruit, thereby, reducing the vigor of the plants and limiting regeneration. Outplanted seedlings of the closely related genus *Clermontia* have been completed removed by slugs (Alvin Yoshinaga, University of Hawaii, Lyon Arboretm, pers. comm., 1995).

D. The inadequacy of existing regulatory mechanisms.

Currently, there is no Federal or State protection for *Cyanea kunthiana*. The State of Hawaii does not recognize this species as endangered until it is federally listed as endangered.

E. Other natural or manmade factors affecting its continued existence.

Alien plant species are a major threat to this species (A. Medeiros III, pers. comm., 1996; S. Perlman, pers. comm., 1996). The original native flora of Hawaii consisted of about 1,000 species, 89 percent of which were endemic. Of the total native and naturalized Hawaiian flora

of 1,817 species, 47 percent were introduced from other parts of the world and nearly 100 species have become pests (Smith 1985; Wagner *et al*. 1990). Naturalized, introduced species compete with native plants for space, light, water, and nutrients (Cuddihy and Stone 1990). Some of these species were brought to Hawaii by various groups of people, including the Polynesian immigrants, for food or cultural reasons. Plantation owners, alarmed at the reduction of water resources for their crops caused by the destruction of native forest cover by grazing feral animals, supported the introduction of alien tree species for reforestation. Ranchers intentionally introduced pasture grasses and other species for agriculture, and sometimes inadvertently introduced weed seeds as well. Other plants were brought to Hawaii for their potential horticultural value (Cuddihy and Stone 1990; Scott *et al*. 1986; Wenkam 1969). Many of these introduced alien plant taxa are highly invasive, out-competing and displacing native plants.

FOR RECYCLED PETITIONS:

a. Is listing still warranted? ___
b. To date, has publication of a proposal to list been precluded by other higher priority listing actions? ___
c. Is a proposal to list the species as threatened or endangered in preparation? ___
d. If the answer to c. above is no, provide an explanation of why the action is still precluded.

LAND OWNERSHIP (Estimate proportion Federal/state/local government/private, identify non-private owners): *Cyanea kunthiana* occurs on private and State lands.

PRELISTING (Describe status of conservation agreements or other conservation activities): None.

REFERENCES (Identify primary sources of information (e.g., status reports, petitions, journal publications, unpublished data from species experts) using formal citation format):

The information in this form is based on the results of a meeting of 20 botanical experts held by the Center for Plant Conservation in December of 1995 and, and has been updated by personal communication with Arthur C. Medeiros III of the Biological Resources Division, U.S. Geological Survey, Steve Perlman of National Tropical Botanical Garden and Hank Oppenheimer of Maui Land and Pineapple Company.

Cuddihy, L.W., and C.P. Stone. 1990. Alteration of native Hawaiian vegetation; effects of humans, their activities and introductions. Coop. Natl. Park Resources Stud. Unit, Hawaii. 138 pp.

Hawaii, Department of Land and Natural Resources. N.d.-a. Summary of Title 13, Chapter 123, Game mammal hunting rules, island of Oahu. Division of Forestry and Wildlife, Honolulu. 2 pp.

Hawaii, Department of Land and Natural Resources. N.d.-b. Summary of Title 13, Chapter 123, Game mammal hunting rules, island of Molokai. Division of Forestry and Wildlife, Honolulu. 2 pp.

Hawaii, Department of Land and Natural Resources. N.d.-c. Summary of Title 13, Chapter 123, Game mammal hunting rules, island of Maui. Division of Forestry and Wildlife, Honolulu. 2 pp.

Medeiros, A.C., Jr., L.L. Loope, and R.A. Holt. 1986. Status of native flowering plant species on the south slope of Haleakala, East Maui, Hawaii. Coop. Natl. Park Resources Stud. Unit, Hawaii, Techn. Rept. 59:1-230.

Scott, J.M., S. Mountainspring, F.L. Ramsey, and C.B. Kepler. 1986. Forest bird communities of the Hawaiian Islands: Their dynamics, ecology, and conservation. Studies in Avian Biology 9:1-429. Cooper Ornithological Society, Los Angeles.

Smith, C.W. 1985. Impact of alien plants on Hawai`i's native biota: in Stone, C.P., and J.M. Scott (eds.), Hawai`i's terrestrial ecosystems: preservation and management. Coop. Natl. Park Resources Stud. Unit, Univ. Hawaii, Honolulu, pp. 180-250.

Stone, C.P. 1985. Alien animals in Hawai`i's native ecosystems: toward controlling the adverse effects of introduced vertebrates: in Stone, C.P., and J.M. Scott (eds.), Hawai'i's terrestrial ecosystems: preservation and management. Coop. Natl. Park Resources Stud. Unit, Univ. Hawaii, Honolulu, pp. 251-197.

Stone, C.P. and L.L. Loope. 1987. Reducing the negative effects of introduced animals on native biotas in Hawaii: what is being done, what needs doing, and the role of national parks. Environmental Conservation 14:245-258.

Tomich, P.Q. 1986. Mammals in Hawai`i; a synopsis and notational bibliography. Bishop Museum Press, Honolulu. 375 pp.

Wagner, W.L., D.R. Herbst, and S.H. Sohmer. 1990. Manual of the flowering plants of Hawai`i. University of Hawaii Press and Bishop Museum Press, Honolulu. Bishop Mus. Spec. Publ. 83:1-1853.

Wenkam, R. 1969. Kauai and the park country of Hawaii. Sierra Club, San Francisco. 160 pp.

LISTING PRIORITY (* after number)

THREAT

Magnitude	Immediacy	Taxonomy	Priority
High	Imminent	Monotypic genus	1
		Species	2
		Subspecies/population	3
	Non-imminent	Monotypic genus	4
		Species	5 *
		Subspecies/population	6
Moderate to Low	Imminent	Monotypic genus	7
		Species	8
		Subspecies/population	9
	Non-imminent	Monotypic genus	10
		Species	11
		Subspecies/population	12

Rationale for listing priority number:

Magnitude:

Imminence:

APPROVAL/CONCURRENCE: Lead Regions must obtain written concurrence from all other Regions within the range of the species before recommending changes to the candidate list, including listing priority changes; the Regional Director must approve all such recommendations. The Director must concur on all additions of species to the candidate list, removal of candidates, and listing priority changes.

Approve: Rowan Gould March 6, 2003
Regional Director, Fish and Wildlife Service Date

Concur: _____ _____
Director, Fish and Wildlife Service Date

Do not concur: _____ _____
Director, Fish and Wildlife Service Date

Director's Remarks:

-

-

Date of annual review: 2/03
Conducted by: _____

Comments:

-

-