CANDIDATE ASSESSMENT AND LISTING PRIORITY ASSIGNMENT FORM

SCIENTIFIC NAME: *Cyanea asplenifolia*

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: 19-SEP-97
___ 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.):

Cyanea asplenifolia was thought to be extinct following collections in 1920 on west Maui, until it was rediscovered in 1995 on east Maui. Two additional populations of approximately 30 individuals total have been rediscovered on west Maui, but the largest population is found in Kipahulu Valley on east Maui. Until 1991, when flowering occurred, the Kipahulu population was thought to be *Cyanea grimesiana* ssp. *grimesiana*. Flowers and fruits led to a valid identification of this population as *Cyanea asplenifolia*. In 1991, 350 individuals were counted. During a return visit in 1995, the population was estimated to be only approximately 200 individuals, showing a decline in the population for reasons yet to be determined. Typical habitat is mesic forest dominated by *Metrosideros polymorpha* (`ohi`a) and *Acacia koa* (koa) (Lammers 1990; Art Medeiros, USGS Biological Resources Division, *in litt*. and pers. comms. 1996 and 1997; Steve Perlman, National Tropical Botanical Garden, pers. comm., 1996).

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. <u>The present or threatened destruction, modification, or curtailment of its habitat or range.</u> *Cyanea asplenifolia* is threatened pigs and goats (Art Medeiros, 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 four 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 (DLNR) n.d.-a, n.d.-b, n.d.-c, 1990). Pigs while rooting in the ground to feed on invertebrates and plant material, 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).

The goat (*Capra hircus*), a species originally native to the Middle East and India, was successfully introduced to the Hawaiian Islands in 1792. Currently, populations exist on Kauai, Oahu, Maui, and Hawaii. Goat hunting is allowed year-round or during certain months, depending on the area (DLNR n.d.-a, n.d.-b, n.d.-c, 1990). 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; Cuddihy and Stone 1990; Culliney 1988; Scott *et al*. 1986; Tomich 1986; van Riper and van Riper 1982).

Although this plant species survives on steep cliffs inaccessible to goats, the original range of this plant was probably much larger. The species is now vulnerable to the long-term, indirect effects of goats, such as large-scale erosion (Corn *et al*. 1979). Dry and mesic habitats were damaged in the past by goats, and these effects are still apparent in the form of alien vegetation and erosion. This species is threatened by direct damage from feral goats, such as trampling of plants and seedlings and erosion of substrate (Clarke and Cuddihy 1980; Culliney 1988; Scott *et al*. 1986; van Riper and van Riper 1982).

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

None known.

C. Disease or predation.

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; Loyal Mehrhoff, Service, 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 and ranges into the wet forests. Black rats, and to a lesser extent *Mus musculus* (house mouse), *R. 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 utilized by 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, pers. comm., 1994). Rat damage to the stems of species of *Cyanea* has been reported in the wet forests of Kauai. On the island of Hawaii, a species in a closely related genus was completely defoliated by rats (Jack Jeffrey, Service, pers. comm., 1995). It is very likely that rats eat the fruits of this species (Loyal Mehrhoff, Service, *in litt*. 1994; S. Perlman, pers. comm., 1994).

Slugs have been observed defoliating cultivated plants of *Cyanea asplenifolia* (Art Medeiros, pers. comm., 1997). Little is known about the predation of certain rare Hawaiian plants by slugs in native habitats. 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 (L. Mehrhoff, *in litt*. 1994; S. Perlman, pers. comm., 1994). Outplanted seedlings of the closely related genus *Clermontia* have been completed removed by slugs (Alvin Yoshinaga, University of Hawaii's Lyon Arboretm, pers. comm., 1995).

D. The inadequacy of existing regulatory mechanisms.

Currently, there is no Federal or State protection for *Cyanea asplenifolia*.

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

Numerous weed species threaten *Cyanea asplenifolia* (Art Medeiros, 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 taxa, 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 which are highly invasive, out-competing and displacing native plant taxa.

One recently naturalized species that is a threat to *Cyanea asplenifolia* is *Cyathea cooperi* (Australian treefern) (A. Medeiros, pers. comm., 1996). Recently introduced to Hawaii, *Cyathea cooperi* (Australian tree fern) is being promoted for commercial propagation in Hawaii to decrease exploitation of native tree ferns. Australian tree fern has recently become established on the island of Maui, and seriously threatens the largest known population of *Cyanea asplenifolia* (Cuddihy and Stone 1990; A. Medeiros, pers. comm., 1994).

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): Quantify landownership: The largest population is found on the boundary between State, private and Federal land in Haleakala National Park. Exact ownership is unknown, as this is an unsurveyed boundary of the national park. The two smaller populations are found on State and private land.

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 two meetings of 20 botanical experts held by the Center for Plant Conservation in December 1995 and November 1996, who are cited

where appropriate in the text.

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.

Culliney, J.L. 1988. Islands in a far sea; nature and man in Hawaii. Sierra Club Books, San Francisco. 410 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.

Hawaii, Department of Land and Natural Resources. 1985. Hunting in Hawaii, fourth revision. Division of Forestry and Wildlife, Honolulu, 32 pp.

Lammers, T.G. 1990. Campanulaceae: in Wagner, W.L., D.R. Herbst, and S.H. Sohmer, Manual of the flowering plants of Hawai'i. University of Hawaii Press and Bishop Museum Press, Honolulu. Bishop Mus. Spec. Publ. 83:420-489.

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.

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

van Riper, S.G., and C. van Riper III. 1982. A field guide to the mammals in Hawaii. The Oriental Publishing Company, Honolulu. 68 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:

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

Comments:

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