U.S. FISH AND WILDLIFE SERVICE
SPECIES ASSESSMENT AND LISTING PRIORITY ASSIGNMENT FORM

SCIENTIFIC NAME: *Lysimachia daphnoides*

COMMON NAME: Lehua makanoe

LEAD REGION: Region 1

INFORMATION CURRENT AS OF: June 2004

STATUS/ACTION
___ Initial 12-month Petition Finding: ___ not warranted
___ warranted
___ warranted but precluded (also complete (c) and (d) in section on petitioned candidate species- why action is precluded)
____ Species assessment - determined species did not meet the definition of endangered or threatened under the Act and, therefore, was not elevated to Candidate status
___ New candidate
_X__ Continuing candidate
___ Non-petitioned
_X__ Petitioned - Date petition received: May 11, 2004
__ 90-day positive - FR date: _____
__ 12-month warranted but precluded - FR date: _____
_N_ Is the petition requesting a reclassification of a listed species?
_X__ Listing priority change
Former LP: _5__
New LP: _2__
Latest Date species became a Candidate: 1999
___ Candidate removal: Former LP: __
___ A - Taxon is more abundant or widespread than previously believed or not subject to the 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.
___ I - Insufficient information exists on biological vulnerability and threats to support listing.
___ 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: Flowering plants, Myrsinaceae (Myrsine family)

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

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

LEAD REGION CONTACT: Scott McCarthy, 503-231-6131

LEAD FIELD OFFICE CONTACT: Pacific Islands Fish & Wildlife Office, Christa Russell, 808-792-9451

BIOLOGICAL INFORMATION:

Species Description *Lysimachia daphnoides* is a small shrub forming clumps 2 to 5 decimeters (0.7 to 1.6 feet (ft)) tall, with several stems and reddish brown to dark brown bark. Leaves are closely spaced, alternate, and oblong to oblanceolate, 20 to 53 millimeters (mm) (0.8 to 2 inches (in)) long, and 6 to 14 mm (0.2 to 0.6 in) wide. Flowers are solitary in the leaf axils, six- to seven-merous, with a dark purple or dark burgundy, and campanulate corolla. Capsules are subglobose and seeds are dark brown and 2 mm (0.08 in) long (Wagner *et al*. 1999).

Taxonomy *Lysimachia daphnoides* was described by Hillebrand. This species is recognized as a distinct taxon in Wagner *et al*. 1999. In the 2003 supplement to the *Manual of the Flowering Plants of Hawaii*, this genus has been moved from the Primulaceae to the Myrsinaceae family (Wagner and Herbst 2003).

Habitat *Lysimachia daphnoides* is found in bogs at elevations between 1,220 and 1,570 meters (4,003 and 5,151 ft) (Wagner *et al*. 1999).

Historical and Current Range/Current Status This species is known from nine populations totaling 180 to 300 individuals in the Alakai area of the island of Kauai (Steve Perlman, National Tropical Botanical Garden, pers. comm. 1996). Due to inclement weather and lack of funds, Service staff have not been able to conduct all of the biannual monitoring of this species as expected, but we have monitored all of the populations within the last three years and the numbers have fluctuated very little (Marie Bruegmann, U.S. Fish and Wildlife Service, pers. comm.. 2004).

THREATS:

A. The present or threatened destruction, modification, or curtailment of its habitat or range.] *Lysimachia daphnoides* is threatened by feral pigs (*Sus scrofa*) that degrade and destroy habitat (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 habitat on Kauai. Pigs are currently present on Kauai and four other islands, 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. Pigs are a major vector in the spread of many introduced plant species (Smith 1985; Stone 1985; Cuddihy and Stone 1990; Medeiros *et al*. 1986; Scott *et al*. 1986; Tomich 1986; Wagner *et al*. 1999).

B. Overutilization for commercial, recreational, scientific, or educational purposes.
This species is threatened by trampling from hikers (S. Perlman, pers. comm. 1996).

C. Disease or predation.
Destruction of individual plants from predation by pigs is highly probable. In addition, no viable seeds have been observed due to damage to fruits from a boring insect. This insect has not yet been identified, and may be a native species (Marie Bruegmann, U.S. Fish and Wildlife Service (Service), pers. comm. 2004).

D. The inadequacy of existing regulatory mechanisms.
The Forest Reserve Act of 1903 was an important action that protected watersheds in Hawaii. This act has been strengthened and re-titled Hawaii Department of Land and Natural Resources (DLNR) Title 13, Chapter 104 Rules Regulating Activities Within Forest Reserves and provides protection to native forest values from certain degrading factors caused by human activities. The Hawaii DLNR Regulation (Administrative Rule No. 1, Chapter 3) established the 4,022 ha (9,939 ac) Alakai Wilderness Preserve in 1964, recognizing the pristine forest values of that area and the need to control potential degrading factors.

Pig hunting is allowed on all islands either year-round or during certain months, depending on the area (Hawaii Department of Lands and Natural Resources n.d.-a, n.d. b, n.d.-c, 1990). Hunting is allowed within the Alakai Wilderness, but because of its remoteness and rugged topography, little public hunting is done in the areas where this species occurs.

E. Other natural or manmade factors affecting its continued existence.
Alien plant species are also becoming a greater threat to *Lysimachia daphnoides* at this time. Introduced plant species are minimal in the bog habitat, but will continue to increase if the feral pigs are not removed (Perlman and Wood 1995).

Juncus planifolius (no common name) is a perennial rush which has naturalized in moist, open, disturbed depressions on margins of forests and in bogs on Kauai, Oahu, Molokai, Maui, and Hawaii (Coffey 1990). *Juncus planifolius* is only found in disturbed areas, so the removal of feral pigs will most likely stem the spread of this species (Perlman and Wood 1995; S. Perlman, pers. comm. 1997).

Andropogon virginicus (broomsedge) is a perennial, tufted grass, which is naturalized on Kauai, Oahu, and Hawaii along roadsides and in disturbed dry to mesic forest and shrubland (O'Connor 1990; Clyde Imada and Bernice Pauahi, Bishop Museum, pers. comm. 1997). While the bogs are

not dry to mesic habitat, the saturation of soil in the bogs creates a lack of oxygen, which inhibits the uptake of water by plant roots, resulting in drought conditions (Joan Canfield, Service, pers. comm. 1996). Broomsedge is beginning to establish in the bogs of the Alakai that are most easily accessible to humans and may become a threat to *Lysimachia daphnoides* if disturbance to the bogs continues (Perlman and Wood 1995).

While we do not have direct documentation of decline in this species due to presence of alien pest plants, numerous studies have shown that numerous alien pest plants can outcompete almost any native species that has been studied in both Hawaii and other tropical islands. In addition, they often radically alter the habitat to a point that it is no longer suitable for the native species (Meyer and Florence 1996, Medeiros and Loope 1997, Medeiros *et al*. 1992, Smith 1985, Loope and Medeiros 1992, Smather and Gardner 1978, Ellshoff *et al*. 1995, Loope *et al*. in press).

SUMMARY OF REASONS FOR ADDITION, REMOVAL OR LISTING PRIORITY CHANGE: The listing priority number has been changed from 5 to 2 because the threats to the species are ongoing and therefore imminent.

____Is the removal based on a Policy for Evaluation of Conservation Efforts When Making Listing Decisions (PECE) finding? If "Yes", summarize the specific PECE evaluation criteria that were met in determining that the conservation effort is sufficiently certain to be implemented and effective so as to have contributed to the elimination or adequate reduction of one or more threats to the species identified through the section 4(a)(1) analysis.

FOR PETITIONED CANDIDATE SPECIES (also complete c and d for initial 12-month petition findings):

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

We find that the immediate issuance of a proposed rule and timely promulgation of a final rule for this species has been, for the preceding 12 months, and continues to be, precluded by higher priority listing actions (including candidate species with lower LPNs). During the past 12 months, almost our entire national listing budget has been consumed by work on various listing actions to comply with court orders and court-approved settlement agreements, emergency listings, and essential litigation-related, administrative, and program management functions. We will continue to monitor the status of this species as new information becomes available. This review will determine if a change in status is warranted, including the need to make prompt use of emergency listing procedures. For information on listing actions taken over the 12 months, see the discussion of "Progress on Revising the Lists," in the current CNOR which can be viewed on our Internet website (http://endangered.fws.gov/).

LAND OWNERSHIP:
Hawaii State-owned land.

PRELISTING:
Based on the International Union for Conservation of Nature and Natural Resources Red Plant Data Book rarity categories, this species is recognized as Rare (could be considered at risk) by Wagner, Herbst, and Sohmer in the 1999 *Manual of Flowering Plants of Hawai`i.*

The Service, working in cooperation with the State of Hawaii, Division of Forestry and Wildlife, has fenced three of the bogs in which *Lysimachia daphnoides* currently occurs. Funding was made available from the Regional Office in fiscal year 1995 to begin this work, but additional funding will be required for annual fence maintenance, monitoring and weed control.

DESCRIPTION OF MONITORING:
Much of 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 has been updated with information from a survey of Kauai bogs by National Tropical Botanical Garden in 1995.

We have incorporated updated and new information on this species from our files and the most recent supplement to the *Manual of the Flowering Plants of Hawaii* (Wagner and Herbst 2003). In addition, in 2004, the Pacific Islands office contacted the following species experts: Bob Hobdy, retired from Hawaii Division of Forestry and Wildlife; Joel Lau, Hawaii Natural Heritage Program; Art Medeiros, USGS Biological Resources Discipline; Hank Oppenheimer, resource manager for Maui Land and Pineapple Company; and Steve Perlman and Ken Wood, National Tropical Botanical Garden. New information on status and management was provided by Marie Bruegmann of the U.S. Fish and Wildlife Service.

On May 11, 2004, we received a petition dated May 4 from the Center for Biological Diversity (CBD) and others to list this species. This petition was thoroughly reviewed but did not provide any new information on this species (CBD et al. 2004).

REFERENCES:

Center for Biological Diversity, Dr. Jane Goodall, Dr. E.O. Wilson, Dr. Paul Ehrlich, Dr. John Terborgh, Dr. Niles Eldridge, Dr. Thomas Eisner, Dr. Robert Hass, Barbara Kingsolver, Charles Bowden, Martin Sheen, the Xerces Society, and the Biodiversity Conservation Alliance. 2004. Hawaiian Plants: petitions to list as federally endangered species. May 4, 2004.

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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.

Ellshoff, Z.E., D.E. Gardner, C. Wikler, and C.W. Smith. 1995. Annotated bibliography of the genus *Psidium*, with emphasis on *P. cattleianum* (strawberry guava) and *P. guajava* (common guava), forest weeds in Hawai`i. Cooperative National Park Resources Studies Unit, University of Hawaii. Technical Report 95.

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.

Loope, L.L. and A.C. Medeiros. 1992. A new and invasive grass on Maui. Newsletter of the Hawaiian Botanical Society 31: 7-8.

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Medeiros, A.C., L.L. Loope, P. Conant & S. McElvaney. 1997. Status, ecology, and management of the invasive plant, *Miconia calvescens* DC (Melastomataceae) in the Hawaiian Islands. Bishop Mus. Occas. Pap.48: 23-36.

Medeiros, A.C., L.L. Loope, T. Flynn, S.J. Anderson, L.W. Cuddihy, and K.A. Wilson. 1992. Notes on the status of an invasive Australian tree fern (*Cyathea cooperi*) in Hawaiian rain forests. American Fern Journal 82: 27-33.

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.

O'Connor, P.J. 1990. Poaceae: 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. 83:1481-1604.

Perlman, S. and K. Wood. 1995. Kauai Bog Survey Report. Prepared for the U.S. Fish and Wildlife Service, Honolulu, HI.

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.

Smather, G.A. and D.E. Gardner. 1978. Stand analysis of an invading firetree (*Myrica faya* Aiton) population, Hawai`i. Proceeding of the Second Conference on Natural Science, Hawaii Volcanoes National Park, pp. 274-288.

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. 251-297.

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. 1999. Manual of the Flowering Plants of Hawai`i, Bishop Mus. Spec. Publ. 97:1-1918. University of Hawaii Press and Bishop Museum Press, Honolulu.

Wagner, W.L. and D.R. Herbst. 2003. Electronic supplement to the manual of flowering plants of Hawai‘i, version 3.1. December 12, 2003. Available from the Internet. URL: http://rathbun.si.edu/botany/pacificislandbiodiversity/hawaiianflora/supplement.htm.

LISTING PRIORITY:

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

Yes Have you promptly reviewed all of the information received regarding the species for the purpose of determining whether emergency listing is needed?

Rationale for listing priority number:

Magnitude:
This species is highly threatened by pigs and hikers that degrade and destroy habitat, and by nonnative plants that outcompete and displace it. Threats to montane bog habitat of *Lysimachia daphnoides* occur throughout its range, and are expected to continue or increase without control or eradication.

Imminence:
Threats to *Lysimachia daphnoides* from pigs, hikers, and nonnative plants are imminent because they are ongoing.

Is Emergency Listing Warranted?
No. The species does not appear to be appropriate for emergency listing at this time because the immediacy of the threats is not so great as to imperil a significant proportion of the taxon within the time frame of the routine listing process. In addition, the Service, working in cooperation with the State of Hawaii, Division of Forestry and Wildlife, has fenced three of the bogs in which *Lysimachia daphnoides* currently occurs, which will benefit individuals of this species. If it becomes apparent that the routine listing process is not sufficient to prevent large losses that may result in this species' extinction, then the emergency rule process for this species will be

initiated. We will continue to monitor the status of *L. daphnoides* as new information becomes available. This review will determine if a change in status is warranted, including the need to make prompt use of emergency listing procedures.

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 12-month petition findings, additions of species to the candidate list, removal of candidate species, and listing priority changes.

Approve: David B. Allen
7/19/04
Regional Director, Fish and Wildlife Service
Date

Concur: Matt Hogan, Acting 5/2/05
Director, Fish and Wildlife Service Date

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

Director's Remarks: _____

_____

_____

Date of annual review: June 2004
Conducted by: _____

Comments: _____

_____

_____

(rev. 4/22/04)