

Scaevola coriacea
(dwarf naupaka)

**5-Year Review
Summary and Evaluation**

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

5-YEAR REVIEW

Species reviewed: *Scaevola coriacea* (dwarf naupaka)

TABLE OF CONTENTS

1.0	GENERAL INFORMATION	3
1.1	Reviewers	3
1.2	Methodology used to complete the review:.....	3
1.3	Background:	3
2.0	REVIEW ANALYSIS.....	5
2.1	Application of the 1996 Distinct Population Segment (DPS) policy	5
2.2	Recovery Criteria	5
2.3	Updated Information and Current Species Status	7
2.4	Synthesis.....	9
3.0	RESULTS	14
3.3	Recommended Classification:	14
3.2	New Recovery Priority Number:	15
3.3	Listing and Reclassification Priority Number:	15
4.0	RECOMMENDATIONS FOR FUTURE ACTIONS.....	15
5.0	REFERENCES.....	16
	Signature Page.....	19

5-YEAR REVIEW
***Scaevola coriacea* / dwarf naupaka**

1.0 GENERAL INFORMATION

1.1 Reviewers

Lead Regional Office:

Region 1, Endangered Species Program, Division of Recovery, Jesse D'Elia, (503) 231-2071

Lead Field Office:

Pacific Islands Fish and Wildlife Office, Loyal Mehrhoff, Field Supervisor, (808) 792-9400

Cooperating Field Office(s):

N/A

Cooperating Regional Office(s):

N/A

1.2 Methodology used to complete the review:

This review was conducted by staff of the Pacific Islands Fish and Wildlife Office of the U.S. Fish and Wildlife Service (USFWS), beginning on April 29, 2008. The review was based on a review of current, available information. The National Tropical Botanical Garden provided an initial draft of portions of the review and recommendations for conservation actions needed prior to the next five-year review. The evaluation of Tamara Sherrill, biological consultant, was reviewed by the Plant Recovery Coordinator. The document was then reviewed by the Assistant Field Supervisor for Endangered Species and Acting Deputy Field Supervisor before submission to the Field Supervisor for approval.

1.3 Background:

1.3.1 Federal Register (FR) Notice citation announcing initiation of this review:

USFWS. 2008. Endangered and threatened wildlife and plants; initiation of 5-year reviews of 70 species in Idaho, Montana, Oregon, Washington, and the Pacific Islands. Federal Register 73(83): 23264-23266.

1.3.2 Listing history

Original Listing

FR notice: USFWS. 1986. Endangered and threatened wildlife and plants; determination of endangered status for *Scaevola coriacea* (dwarf naupaka). Federal Register 51(95):17971-17974

Date listed: May 16, 1986

Entity listed: Species

Classification: Endangered

Revised Listing, if applicable

FR notice: N/A

Date listed: N/A

Entity listed: N/A

Classification: N/A

1.3.3 Associated rule makings :

USFWS. 2003. Endangered and threatened wildlife and plants; designation of critical habitat for 60 plant species from the islands of Maui and Kahoolawe, Hawaii; final rule. Federal Register 68(93):25934-26165.

Critical habitat was not designated for *Scaevola coriacea* when it was listed in 1986 because publication of critical habitat descriptions would have made the species subject to collecting and vandalism. Also, there were no populations of the species found on Federal land, and since collecting is not an activity regulated by the Endangered Species Act with regard to plants, except for endangered plants on lands under Federal jurisdiction, designating critical habitat was concluded to provide no net benefit for the species (USFWS 1986). Critical habitat was not proposed or designated in 2003 due to its exclusion from the lawsuit that precipitated those designations (USFWS 2003). These determinations may be revisited.

1.3.4 Review History:

Species status review [FY 2009 Recovery Data Call (August 2009)]:
Declining

Recovery achieved:

1 (0-25%) (FY 2007 Recovery Data Call – this is the last year this was reported)

1.3.5 Species' Recovery Priority Number at start of this 5-year review:

2

1.3.6 Current Recovery Plan or Outline

Name of plan or outline: Recovery plan for the Maui plant cluster (Hawaii). U.S. Fish and Wildlife Service, Portland, Oregon. 130 pages.

Date issued: July 29, 1997.

Dates of previous revisions, if applicable: N/A

2.0 REVIEW ANALYSIS

2.1 Application of the 1996 Distinct Population Segment (DPS) policy

2.1.1 Is the species under review a vertebrate?

Yes
 No

2.1.2 Is the species under review listed as a DPS?

Yes
 No

2.1.3 Was the DPS listed prior to 1996?

Yes
 No

2.1.3.1 Prior to this 5-year review, was the DPS classification reviewed to ensure it meets the 1996 policy standards?

Yes
 No

2.1.3.2 Does the DPS listing meet the discreteness and significance elements of the 1996 DPS policy?

Yes
 No

2.1.4 Is there relevant new information for this species regarding the application of the DPS policy?

Yes
 No

2.2 Recovery Criteria

2.2.1 Does the species have a final, approved recovery plan containing objective, measurable criteria?

Yes
 No

2.2.2 Adequacy of recovery criteria.

2.2.2.1 Do the recovery criteria reflect the best available and most up-to date information on the biology of the species and its habitat?

Yes
 No

2.2.2.2 Are all of the 5 listing factors that are relevant to the species addressed in the recovery criteria?

Yes
 No

2.2.3 List the recovery criteria as they appear in the recovery plan, and discuss how each criterion has or has not been met, citing information:

A synthesis of the threats (Factors A, B, C, D, and E) affecting this species is presented in section 2.4.

Stabilizing, downlisting, and delisting objectives are provided in the recovery plan for the Maui plant cluster (USFWS 1997), based on whether the species is an annual, a short-lived perennial (fewer than 10 years), or a long-lived perennial. *Scaevola coriacea* is a short-lived perennial, and to be considered stabilized, which is the first step in recovering the species, the taxon must be managed to control threats (*e.g.*, fenced, weeding, etc.) and be represented in an *ex situ* (off-site) collection. In addition, a minimum of three populations should be documented on Maui, and if possible, at least one other island where they now occur 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 *Scaevola coriacea* should be documented on Maui, and if possible, at least one other island where they now occur or occurred historically. Each of these populations must be naturally reproducing, stable or increasing in number, and secure from threats, with a minimum of 300 mature individuals per population. Each population should persist at this level for a minimum of five consecutive years before downlisting is considered.

This recovery objective has not been met.

For delisting, a total of eight to ten populations of *Scaevola coriacea* should be documented on Maui, and if possible, at least one other island where they now occur or occurred historically. Each of these populations must be naturally reproducing, stable or increasing in number, and secure from threats, with 300 mature individuals per population for short-lived perennials. Each population should persist at this level for a minimum of five consecutive years before delisting is considered.

This recovery objective has not been met.

2.3 Updated Information and Current Species Status

In addition to the status summary table below, information on the species' status and threats was included in the final critical habitat rule (which did not designate critical habitat for this species but included status information) referenced above in section 1.3.3 ("Associated Rulemakings") and in section 2.4 ("Synthesis") below, which also includes any new information about the status and threats of the species.

Table 1. Status of *Scaevola coriacea* from listing through 5-year review.

Date	No. wild individuals	No. outplanted	Stabilization Criteria identified in Recovery Plan	Stabilization Criteria Completed?
1986 – listing	350	0	All threats managed in all 3 populations	No
			Complete genetic storage	No
			3 populations with 50 mature individuals each	No
1997 – recovery plan	<340		All threats managed in all 3 populations	No
			Complete genetic storage	Partially
			3 populations with 50 mature individuals each	No
2009 – 5-year review	108	160	All threats managed	No
			Complete genetic storage	Yes
			3 populations with 50 mature individuals each	No

2.3.1 Biology and Habitat

2.3.1.1 New information on the species’ biology and life history:

2.3.1.2 Abundance, population trends (e.g. increasing, decreasing, stable), demographic features (e.g., age structure, sex ratio, family size, birth rate, age at mortality, mortality rate, etc.), or demographic trends:

2.3.1.3 Genetics, genetic variation, or trends in genetic variation (e.g., loss of genetic variation, genetic drift, inbreeding, etc.):

2.3.1.4 Taxonomic classification or changes in nomenclature :

2.3.1.5 Spatial distribution, trends in spatial distribution (e.g. increasingly fragmented, increased numbers of corridors, etc.), or historic range (e.g. corrections to the historical range, change in distribution of the species' within its historic range, etc.):

2.3.1.6 Habitat or ecosystem conditions (e.g., amount, distribution, and suitability of the habitat or ecosystem):

2.3.1.7 Other:

2.3.2 Five-Factor Analysis (threats, conservation measures, and regulatory mechanisms)

2.3.2.1 Present or threatened destruction, modification or curtailment of its habitat or range:

2.3.2.2 Overutilization for commercial, recreational, scientific, or educational purposes:

2.3.2.3 Disease or predation:

2.3.2.4 Inadequacy of existing regulatory mechanisms:

2.3.2.5 Other natural or manmade factors affecting its continued existence:

2.4 Synthesis

Scaevola coriacea was known historically from all the main Hawaiian Islands except Kahoolawe, but is now only known from three naturally occurring populations. The most abundant population occurs on West Maui with 92 individuals persisting on the lithified sand dunes of Waiehu, last visited in 2008. About five more wild individuals are on Maui County property on a lithified dune along a roadside in the same area. Until the 1980s, a small population occurred at what is now Maui Coastal Land Trust Waihee Dunes Preserve. This plant or plants are dead, but the site has been used for outplanting by Maui Coastal Land Trust and Plant Extinction Prevention Program staff. On Mokeehia Islet, off West Maui, 15 individuals were observed in 1981 but these individuals have since died off. In 2002, *Scaevola coriacea* was outplanted there, but was gone by 2005. Wild individuals of *S. coriacea* were reported from the Kaupo region of East Maui in the 1980s, but Ken Wood surveyed that area without finding it, and believes those individuals have perished. Individuals of *S. coriacea*

growing around Kahakuloa, West Maui, are not wild (Wood 2008). The remaining two populations occur on islets which lie off the north coast of Molokai: Okala with eight individuals observed in 2006, clustered on the very top of the islet, and Moku Hooniki with three individuals observed in 2006. This species is currently comprised of a total of 108 naturally occurring individuals (Hawaii Department of Land and Natural Resources 2007; Wood 2008).

This represents a reduction in numbers of both populations and individuals since the recovery plan for the species was designed in 1997. There were then four surviving populations of this species: Waiehu Point with an estimated 300 individuals; Kaupo with 20 individuals; Mokeehia Islet with 15 individuals; and Moku Hooniki Islet with four to five individuals (USFWS 1997).

Several studies have looked at the evolution of *Scaevola* species throughout the Pacific. One study indicates an Australian origin for *Scaevola*, with six separate dispersal events, three of which resulted in the establishment of the species on the Hawaiian islands (Howarth 2003). Another study demonstrates that Hawaiian *Scaevola* species have hybridized to create new species, a usual type of hybridization called hybrid speciation, in which hybridization occurs without a change in the chromosome number (Howarth 2005).

The Waiehu Dunes in West Maui contains the largest population of *Scaevola coriacea*. Individuals there grow within the coastal lithified sand dunes and are associated with native species including *Bidens mauiensis* (kookoolau), *Boerhavia repens* (alena), *Fimbristylis cymosa* (mauu aki aki), *Jacquemontia ovalifolia* subsp. *sandwicensis* (pau-o-Hiiaka), *Heliotropium* sp. (kipukai), *Melanthera integrifolia* (nehe), *Nama sandwicense* (hinahina kahakai), *Osteomeles anthyllidifolia* (ulei), *Scaevola taccada* (naupaka kahakai), *Sida fallax* (ilima), and *Tribulus cistoides* (nohu) (Perlman 2008; N. Tangalin, National Tropical Botanical Garden, pers. comm. 2008; Wood 2008).

Okala, the tallest of Molokai's offshore islets reaches 120 meters (394 feet) elevation and has an estimated area of 30,000 square meters (7.4 acres). Okala's vegetation is a mixture of low growing native shrub species such as *Artemisia australis* (ahinahina), *Chamaesyce celastroides* var. *amplectens* (akoko), *Chenopodium oahuense* (ahehea), *Osteomeles anthyllidifolia*, *Scaevola taccada*, *Senna gaudichaudii* (kolomona), *Sida fallax*, and *Wikstroemia uva-ursi* (akia). Vines woven in the shrubs are *Cassytha filiformis* (kaunaoa pehu), *Cocculus orbiculatus* (huehue), and *Ipomoea tuboides* (Hawaiian moon flower). Common native herbs include *Bidens molokaiensis*, *Dianella sandwicensis* (uki uki), *Melanthera integrifolia*,

Peperomia tetraphylla (ala ala wai nui), *Plectranthus parviflorus* (ala ala wai nui pua ki), *Portulaca lutea* (ihi), *Schiedea globosa* (no common name [NCN]), and *Waltheria indica* (uhaloa). Occasional trees of *Diospyros sandwicensis* (lama) are present. Grasses and sedges include *Carex meyenii* (NCN), *Cyperus phleoides* (NCN), and *Eragrostis variabilis* (kawelu). The only native fern species present on Okala is *Doryopteris decipiens* (kumuniu) (National Tropical Botanical Garden 2008a; Wood 2008).

Moku Hooniki islet is a relic tuff cone located in the Pailolo channel, east of Halawa Valley on Molokai. It is 5.7 hectares (2.5 acres) of dry coastal shrubland. Associated native plant species include *Boerhavia repens*, *Chamaesyce celastroides* var. *amplectens*, *Fimbristylis cymosa* subsp. *umbellata-capitata* (mauu aki aki), *Heliotropium curassavicum* (kipukai), *Jacquemontia ovalifolia* subsp. *sandwicensis*, *Melanthera integrifolia*, *Panicum fauriei* var. *fauriei* (NCN), *Panicum torridum* (kakonakona), *Portulaca lutea*, *Scaevola taccada*, *Sesuvium portulacastrum* (akulikuli), and *Sida fallax* (Wood 2008).

A recent study examining the pollinators of Hawaiian species of *Scaevola* included native bees (*Hylaeus* spp.), non-native honey bees (*Apis mellifera*), a few birds, and ants. Because the genus *Scaevola* is protandrous (male flower parts appearing before female parts), in order for pollination to occur, visitors must not only contact the indusium (a specialized cup shaped structure at the tip of the female reproductive part), but they must also visit both male and female phases of the flowers. In *Scaevola coriacea*, the indusium was contacted only at the male phase of flowers, so no pollination was possible. Ants were the primary visitor to *S. coriacea*, but perhaps primarily as nectar robbers. In Hawaii, ants may disrupt plant-pollinator interactions by reducing nectar availability, aggressively guarding floral resources, and preying on larvae of native pollinators or excluding them from nest sites (Factor C). Since native bees were not observed visiting *Scaevola coriacea*, as they must have in the past, pollination is apparently a factor that must be considered in the conservation of this species. Future research on *Scaevola* breeding systems is needed to determine if self pollination can occur on an individual flower during an overlap in male and female flower phases (with or without a pollinator) or from separate flowers on the same plant via a pollen vector. Mating systems should also be examined to assess the extent of outcrossing (pollination between individual plants, as opposed to self pollination) (Elmore 2008).

Threats to the Waiehu population include competition from invasive introduced plant species (Factor E), including *Casuarina equisetifolia* (ironwood), *Cenchrus ciliaris* (buffelgrass), *Chloris* sp. (fingergrass), *Dactyloctenium aegyptium* (beach wiregrass), *Lantana camara* (lantana),

Leucaena leucocephala (haole koa), *Melinis repens* (Natal redtop), *Prosopis pallida* (kiawe), *Schinus terebinthifolius* (Christmas berry), *Stachytarpheta australis* (branched porterweed), and *Tribulus terrestris* (puncture vine). Development and off-road vehicles have impacted and destroyed much of this species' habitat (Factor A). The Waiehu population is the easiest population to access for conservation measures, but is also accessible to other human traffic (N. Tangalin pers. comm. 2008; Wood 2008). Fire (Factor E) is also a threat, as well as *Achatina fulica* (giant African snail) (Factor C), and various ant species that threaten native pollinators (Factor E) (Venette and Larson 2004; Elmore 2008; Schonberg *et al.* 2009).

The Okala population is threatened by landslides (Factor E); drought (Factor E); and invasive introduced plant species (Factor E), primarily *Abutilon grandifolium* (hairy abutilon), *Bidens pilosa* (beggartick), *Bryophyllum pinnatum* (airplant), *Conyza bonariensis* (hairy horseweed), *Cynodon dactylon* (Bermuda grass), *Digitaria insularis* (sourgrass), *Emilia fosbergii* (Flora's paintbrush), *Lantana camara*, *Melinis minutiflora* (molasses grass), *Melinis repens*, *Morinda citrifolia* (noni), *Oxalis corniculata* (yellow wood sorrel), *Microsorium grossum* (maile-scented fern), *Pluchea carolinensis* (marsh fleabane), *Portulaca oleracea* (pigweed), *Psidium guajava* (common guava), *Schinus terebinthifolius*, *Stachytarpheta australis*, *Syzygium cumini* (Java plum), *Tridax procumbens* (coat buttons), and *Turnera ulmifolia* (yellow alder). Okala's rare species are potentially threatened by a loss in reproductive vigor resulting from limited numbers of existing individuals (Factor E) (Wood 2008).

Threats to the Moku Hooniki islet ecosystem include competition from invasive introduced plant species (Factor E) such as *Atriplex semibaccata* (Australian saltbush), *Cenchrus ciliaris*, *Cenchrus echinatus* (common sandbur), *Chenopodium murale* (lamb's quarters), *Cynodon dactylon*, *Dactyloctenium aegyptium*, *Digitaria ciliaris* (Henry's crabgrass), *Eleusine indica* (wiregrass), *Lantana camara*, *Portulaca oleracea*, *Portulaca pilosa* (kiss me quick), and *Sonchus oleraceus* (sow thistle). Possible landslides (Factor E) and drought (Factor E) are also threats, along with the loss of reproductive vigor and health as the result of inbreeding (Factor E) (Wood 2008).

Scaevola coriacea was severely impacted by development on coastal Maui (USFWS 1997). The species has potential uses as a landscape plant because of its groundcover habit, but this use may present a threat to wild populations (Factor B). At least one of the Waiehu subdivision plants had been hacked back by someone illegally harvesting cuttings (H. Oppenheimer, Plant Extinction Prevention Program, pers. comm. 2009).

At this time it is unknown whether rats (*Rattus* spp.) (Factor C) are present on Okala Islet (Wood 2008). Climate change may also pose a threat to *S. coriacea* (Factors A and E). However, current climate change models do not allow us to predict specifically what those effects, and their extent, would be for this species.

Conservation efforts for this species have been considerable, with comprehensive collecting of genetically representative material, large scale propagation, and reintroduction. Broad collaborative efforts between the Plant Extinction Prevention Program and other community organizations on Maui resulted in reintroductions at a number of key locations. From 2006 to 2008, a total of 384 individual plants were reintroduced; at least 160 have been reported as surviving. In 2006, cuttings and seeds were taken from 67 of the 92 Waiehu individuals for propagation at Maui Nui Botanical Gardens. All wild parent individuals were mapped, numbered, and tagged. At Waihee Dunes Preserve, 196 individuals were reintroduced in 2006, with the help of the Maui Coastal Land Trust and Maui Nui Botanical Gardens. One hundred and fifty three were surviving in 2007. Twenty five individuals were reintroduced at Kalepolepo, the site of a fishpond restoration project at National Oceanic and Atmospheric Administration's Humpback Whale National Marine Sanctuary headquarters. The Kalepolepo ahupuaa area is a historic location of *Scaevola coriacea*. These 25 individuals were genetically representative of a full range of the Waiehu population. Despite being watered, weeded and monitored, only five individuals remained in 2007. Thirty individuals were reintroduced on State land at Pauwalu Point, which is a seabird sanctuary and has remnant intact coastal vegetation. This site has not been revisited yet but is believed to have a good survival rate since it is wetter than the other sites. Of the twenty individuals reintroduced at the Kealia National Wildlife, only two survived in 2007 (Hawaii Department of Land and Natural Resources 2007; USFWS 2008). These were dead by 2008. More reintroductions of 67 individuals were done at Waihee Dunes but the tags and possibly some of the plants were vandalized. About 105 plants from 40 individual founders were also planted at the State Kanaha Pond Wildlife Sanctuary in November 2007. Due to nesting of endangered waterbirds the plantings have not all been revisited, although some died during a storm in December 2007, due to flooding. Four individuals were reintroduced in March 2008 at Alau Islet in East Maui, but died by May 2008 from drought. Four plants were reintroduced in March 2008 on Moku Hooniki Islet off Maui's north coast, but have not been revisited yet (H. Oppenheimer, pers. comm. 2009).

The National Tropical Botanical Garden has grown and outplanted 164 individuals of *Scaevola coriacea*, of which 128 are currently living in their gardens at Kahanu, Maui, and on Kauai at Lawai Visitor's Center, Allerton, McBryde, and Limahuli gardens, and 74 are in the nursery at Lawai

(National Tropical Botanical Garden 2008b, 2008c). They also have 101 seeds in storage from the Waiehu population, with ten plants from Waiehu and 63 plants from Okala islet in the nursery (M. Clark, National Tropical Botanical Garden, pers. comm. 2009). Maui Nui Botanical Gardens currently has cuttings from the three individuals found at Moku Hooniki islet on Molokai in their nursery and garden, several plants grown from cuttings from the Waiehu population, and an area intended for a complete genetically representative outplanting of the Waiehu population at the garden (T. Sherrill, Maui Nui Botanical Gardens, pers. comm. 2009). The Kauai, Oahu, and Maui Division of Forestry and Wildlife nurseries, Pahole Rare Plant Facility nursery, and Waimea Valley Arboretum each also have a few plants from either the Waiehu population or from cultivated plants from unknown sources (Kauai Division of Forestry and Wildlife 2008; Pahole Rare Plant Facility 2008; Oahu Division of Forestry and Wildlife 2009; Maui Division of Forestry and Wildlife 2009; Waimea Valley Arboretum 2009).

Hylaeus longiceps, a Hawaiian colletid yellow-faced bee species, is believed to have been a pollinator of *Scaevola coriacea* growing at Waiehu dunes, Maui (Wood 2008). *Hylaeus facilis* is also reported from the Waiehu dune area and is known to be a pollinator of other Hawaiian *Scaevola* (Schonberg *et al.* 2009). Ken Wood also observed an unknown species of Diptera (fly order) on the flowers of *S. coriacea* on Moku Hooniki on Molokai. The role of these species as pollinators is not known, but should be investigated further, as this information could be valuable for future restorations if pollinators could be translocated to enhance regeneration and help create a functional natural community (Wood 2008).

The interim stabilization goals for this species have not been met, as there are only two populations, one wild and one reintroduced, that contain 50 or more mature individuals, and not all threats are being managed (see Table 1). Therefore, *Scaevola coriacea* meets the definition of endangered as it remains in danger of extinction throughout its range.

3.0 RESULTS

3.3 Recommended Classification:

Downlist to Threatened

Uplist to Endangered

Delist

Extinction

Recovery

Original data for classification in error

No change is needed

3.2 New Recovery Priority Number:

Brief Rationale:

3.3 Listing and Reclassification Priority Number:

Reclassification (from Threatened to Endangered) Priority Number: _____

Reclassification (from Endangered to Threatened) Priority Number: _____

Delisting (regardless of current classification) Priority Number: _____

Brief Rationale:

4.0 RECOMMENDATIONS FOR FUTURE ACTIONS

- Research insect associations with *Scaevola coriacea* for improved pollination and seed set.
- Continue collections of representative genetic material.
- Continue reintroduction into appropriate secure locations, with appropriate management and maintenance including weeding of alien vegetation and watering as necessary for establishment.
- Sites recommended for additional restoration plantings of *Scaevola coriacea* include:
 - On Maui: the islets of Mokeehia; Mokumana; Kaemi; Alau; and Puu Kii; coastal sites at the National Tropical Botanical Garden, Hana.
 - On Kahoolawe: the islets of Aleale; and Puu Koae.
 - On Molokai: the islets of Huelo; and Mokapu; and the coastal site of Kukaiwaa.
 - On Lanai: the islets of Puu Pehe; and Nanahoa.
 - On Kauai: the islets of Lehua; and Mokuaeae; in addition to coastal sites at the National Tropical Botanical Garden Lawai gardens.

5.0 REFERENCES

- Elmore, M. 2008. Pollination biology of Hawaiian *Scaevola* (Goodeniaceae). Master of Science thesis for the Department of Botany. University of Hawaii at Manoa, Honolulu, Hawaii. 102 pages.
- Hawaii Department of Land and Natural Resources. 2007. Section 6 annual performance report, statewide endangered plant program, endangered plant restoration and enhancement, plant extinction prevention (formerly genetic safety net) species. Division of Forestry and Wildlife, Honolulu, Hawaii. Prepared for the U.S. Fish and Wildlife Service, Honolulu, Hawaii. 65 pages. Unpublished.
- Howarth, D.G. and D.A. Baum. 2005. Genealogical evidence of homoploid hybrid speciation in an adaptive radiation of *Scaevola* (Goodeniaceae) in the Hawaiian Islands. *Evolution* 59(5):948-961.
- Howarth, D.G., M.H.G. Gustafsson, D.A. Baum, and T.J. Motley,. 2003. Phylogenetic of the genus *Scaevola* (Goodeniaceae): Implications for dispersal patterns across the Pacific Basin and colonization of the Hawaiian Islands. *American Journal of Botany* 90(6):915-923.
- Kauai Division of Forestry and Wildlife, Department of Land and Natural Resources. 2008. Controlled propagation report to U. S. Fish and Wildlife Service. 12 pages. Unpublished.
- Maui Division of Forestry and Wildlife, Department of Land and Natural Resources. 2009. Controlled propagation report to U. S. Fish and Wildlife Service. 5 pages. Unpublished.
- National Tropical Botanical Garden. 2008a. Herbarium database report for *Scaevola coriacea*. National Tropical Botanical Garden, Kalaheo, Hawaii. Available online at <<http://ntbg.org/herbarium/>>. Accessed on 5 January 2010.
- National Tropical Botanical Garden. 2008b. Controlled propagation report to U.S. Fish and Wildlife Service. National Tropical Botanical Garden, Kalaheo, Hawaii. 15 pages. Unpublished.
- National Tropical Botanical Garden. 2008c. Plant out records from living collections database. National Tropical Botanical Garden, Kalaheo, Hawaii.
- Oahu Division of Forestry and Wildlife, Department of Land and Natural Resources. 2009. Controlled propagation report to U. S. Fish and Wildlife Service. 16 pages. Unpublished.

- Pahole Rare Plant Facility. 2008. Controlled propagation report submitted to the U.S. Fish and Wildlife Service. Hawaii Division of Forestry and Wildlife, Honolulu, Hawaii. 14 pages. Unpublished.
- Perlman, S. 2008. *Scaevola coriacea*. National Tropical Botanical Garden, Kalaheo, Hawaii. 2 pages. Unpublished.
- Schonberg, L., S. Jepsen and S. Black. 2009. Petition to list one species of Hawaiian yellow-faced bee *Hylaeus facilis* as an endangered species under the U.S. Endangered Species Act. Xerces Society, Portland, Oregon. 38 pages.
- [USFWS] U.S. Fish and Wildlife Service. 1986. Endangered and threatened wildlife and plants; determination of endangered status for *Scaevola coriacea* (dwarf naupaka). Federal Register 51(95):17971-17974
- [USFWS] U.S. Fish and Wildlife Service. 1997. Recovery plan for the Maui plant cluster (Hawaii). U.S. Fish and Wildlife Service, Portland, Oregon. 130 pages.
- [USFWS] U.S. Fish and Wildlife Service. 2003. Endangered and threatened wildlife and plants; designation of critical habitat for 60 plant species from the islands of Maui and Kahoolawe, Hawaii; final rule. Federal Register 68(93):25934-26165.
- [USFWS] U.S. Fish and Wildlife Service. 2008. Recovery program, rare plant tracking database, species list report. Pacific Islands Fish and Wildlife Office, Honolulu, Hawaii. 74 pages.
- Waimea Valley Arboretum. 2009. Controlled propagation report to U.S. Fish and Wildlife Service. Waimea Valley Arboretum, Waimea, Hawaii. 15 pages. Unpublished.
- Wood, K.R. 2008. Notes on the Conservation Status of *Scaevola coriacea* Nutt. (Goodeniaceae) National Tropical Botanical Garden, Kalaheo, Hawaii. 5 pages. Unpublished.
- Venette, R. and M. Larson. 2004. Mini risk assessment, giant African snail, *Achatina fulica* Bowdich [Gastropoda: Achatinidae]. Department of Entomology, University of Minnesota, St. Paul, Minnesota. 30 pages.

PERSONAL COMMUNICATIONS

- Clark, Margaret. 2009. Seed Bank Manager, National Tropical Botanical Garden, Kalaheo, Hawaii. E-mail to Tamara Sherrill, Biological consultant, dated October 28, 2009. Subject: Controlled propagation of *Scaevola coriacea*.
- Oppenheimer, Hank. 2009. Maui Nui Coordinator, Plant Extinction Prevention Program. E-mail to Margaret Clark, National Tropical Botanical Garden, dated January 5, 2009. Subject: *Scaevola coriacea*.
- Sherrill, Tamara. 2009. Garden Manager, Maui Nui Botanical Gardens, Kahului, Hawaii. Memorandum to files regarding current inventory of *Scaevola coriacea*. Received by U.S. Fish and Wildlife Service, Region 1, dated October 27, 2009.
- Tangalin, Natalia. 2008. Field Botanist, National Tropical Botanical Garden, Kalaheo, Hawaii. E-mail to Margaret Clark, National Tropical Botanical Garden, dated December 03, 2008 and December 17, 2008. Subject: *Scaevola coriacea* populations.

Signature Page
U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW of *Scaevola coriacea* (dwarf naupaka)

Current Classification: E

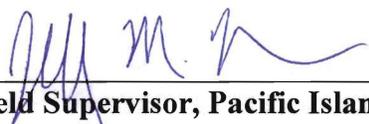
Recommendation resulting from the 5-Year Review:

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

Appropriate Listing/Reclassification Priority Number, if applicable: _____

Review Conducted By:

Marie Bruegmann, Plant Recovery Coordinator
Marilet A. Zablan, Assistant Field Supervisor for Endangered Species
Jeff Newman, Acting Deputy Field Supervisor

Approved  Date **AUG 27 2010**
  **Field Supervisor, Pacific Islands Fish and Wildlife Office**