Spermolepis hawaiiensis
(no common name)

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: *Spermolepis hawaiiensis* (no common name)

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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 the final critical habitat designation for *Spermolepis hawaiiensis* and other species from the islands of Oahu, Lanai, Maui and Kahoolawe, and Kauai and Niihau (USFWS 2003a-d), as well as 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. 1994. Endangered and threatened wildlife and plants; endangered status for 12 plants from the Hawaiian Islands; final rule. Federal Register 59(217):56333-56351.
Date listed: November 10, 1994
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. 2003a. Endangered and threatened wildlife and plants; final designation or nondesignation of critical habitat for 101 plant species from the island of Oahu, Hawaii; final rule. Federal Register 68(116):35949-35998.

USFWS. 2003b. Endangered and threatened wildlife and plants; final designation of critical habitat for three plant species from the island of Lanai, Hawaii; final rule. Federal Register 68(6):1220-1274.

USFWS. 2003c. 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. 2003d. Endangered and threatened wildlife and plants; final designation or nondesignation of critical habitat for 95 plant species from the islands of Kauai and Niihau, Hawaii; final rule. Federal Register 68(39):9116-9479.

Critical habitat was designated for *Spermolepis hawaiiensis* in two units totaling 137 hectares (339 acres) on Oahu (USFWS 2003a), two units totaling 117 hectares (280 acres) on Maui (USFWS 2003c), and two units totaling 183 hectares (452 acres) on Kauai (USFWS 2003d). These designations include habitat on State and private lands (USFWSa,c,d). Critical habitat was proposed but not designated for this species on Lanai because we believed there was a higher likelihood of beneficial conservation activities occurring on this private land without the designation of critical habitat than there would be with a critical habitat designation. In addition, exclusion of the private land on Lanai that had

been proposed as critical habitat would not lead to the extinction of the species (USFWS 2003b). These determinations may be revisited.

1.3.4 Review History:
Species status review [FY 2009 Recovery Data Call (August 2009)]: Unknown

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

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

1.3.6 Current Recovery Plan or Outline
Name of plan or outline: Recovery plan for multi-island plants. U.S. Fish and Wildlife Service, Portland, Oregon. 206 pages plus appendices.
Date issued: July 10, 1999.
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***
__X__ ***No***

2.1.2 Is the species under review listed as a DPS?
____ ***Yes***
__X_ ***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***
__X_ ***No***

2.2 Recovery Criteria

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

__X_ ***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?

__X_ ***Yes***
____ ***No***

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

__X_ ***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, C, D, and E) affecting this species is presented in section 2.4. Factor B (overutilization for commercial, recreational, scientific, or educational purposes) is not known to be a threat to this species.

Stabilizing, downlisting, and delisting objectives are provided in the recovery plan for the multi-island plants (USFWS 1999), based on whether the species is an annual, a short-lived perennial (fewer than 10 years), or a long-lived perennial. *Spermolepis hawaiiensis* is an annual, 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 islands where they now occur or occurred historically. Each of these populations must be naturally reproducing and increasing in number, with a minimum of 100 mature individuals per population.

This recovery objective has been met.

For downlisting, a total of five to seven populations of *Spermolepis hawaiiensis* should be documented on islands 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 500 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 *Spermolepis hawaiiensis* should be documented on islands 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 500 mature individuals per population for annuals. 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 rules 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 *Spermolepis hawaiiensis* from listing through 5-year review.

Date	No. wild individuals	No. outplanted	Downlisting Criteria identified in Recovery Plan	Stabilization Criteria Completed?
1994 (listing)	1,000 - thousands	0	All threats managed in all 5-7 populations	No
			Complete genetic storage	No
			5-7 populations with 500 mature individuals each	No
			Naturally reproducing, stable, and increasing in number	Unknown
			Stable for five consecutive years	Unknown
1999 (recovery plan)	2,000-6,000	0	All threats managed in all 5-7 populations	Partially
			Complete genetic storage	Partially
			5-7 populations with 500 mature individuals each	No
			Naturally reproducing, stable, and increasing in number	Unknown
			Stable for five consecutive years	Unknown
2003 (critical habitat)	1, s	0	All threats managed in all 5-7 populations	Unknown
			Complete genetic storage	Partially
			5-7 populations with 500 mature individuals each	Yes
			Naturally reproducing, stable, and increasing in number	Unknown
			Stable for five consecutive years	Unknown
2009 (5-year review)	10, 200-13,100	>24,000 seeds scattered	All threats managed in all 5-7 populations	Partially
			Complete genetic	Partially

			storage	
			5-7 populations with 500 mature individuals each	No
			Naturally reproducing, stable, and increasing in number	Unknown
			Stable for five consecutive years	Unknown

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

Spermolepis hawaiiensis is an annual herb in the Apiaceae (parsley) family. It is the only species of the genus in Hawaii. Four other *Spermolepis* species occur in North America and Argentina. It grows in open areas, and sometimes in cultivated fields (Wagner *et al.* 1999). Little is known about the time of year this species germinates, or the specific germination requirements, but large numbers of *S. hawaiiensis* individuals have been previously observed after heavy rainfall (U.S. Army Garrison 2007a).

In 1999, *Spermolepis hawaiiensis* was known from a total of 12 populations on Kauai, Oahu, Molokai, Lanai, West Maui, and Hawaii. The total number of individuals statewide at that time was believed to be between 2,000 and 6,000 individuals (USFWS 1999).

When the Manual of the Flowering Plants of Hawaii was published (Wagner *et al.* 1990, 1999), *Spermolepis hawaiiensis* was thought to be extinct on Kauai. Subsequent field surveys have shown that this species still exists within nine valleys on Kauai. The distribution and abundance includes Waimea Canyon at 704 meters (2,310 feet) elevation (200 individuals); Koaie Canyon at 668 meters (2,190 feet) elevation (200 plants); Poomau Canyon at 457 to 518 meters (1,500 to 1,700 feet) elevation (1,000 individuals) above the State *Caesalpinia kavaiensis* (uhi uhi) exclosure in 1994; Hipalau Valley (50 individuals); Kaaweiki Ridge (200 individuals); Milolii at 305 meters (1,001 feet) elevation (1,000 individuals); on Makaha Ridge (700 individuals); and 50 individuals scattered near Hanapepe, in Kapahili Gulch, on a north facing hill at 52 to 61 meters (170 to 200 feet) elevation in 1996, and remained stable in 2005. Several hundred plants were observed in Poomau in 2007, and possibly more would be found if a larger area was surveyed (Wood 2009). On Makaha Ridge, along the north-northeast facing cliffs over Makaha Valley at the Pacific Missile Range Facility site, about 500 individuals of *S. hawaiiensis* were seen at 396 to 457 meters (1,300 to 1,500 feet) elevation. A second colony containing about 200 individuals occurred on steep north facing valley walls to the south of the Pacific Missile Range Facility Helicopter Landing Zone. This grouping occurred at around 350 meters (1,150 feet) elevation (Wood 2009). At Nualolo Aina, in the lower valley around terraces, ten individuals were observed in 2001 at 49 to 61 meters (161 to 200 feet) elevation and 700 individuals were observed in 2006 at 351 meters (1,552 feet) elevation (National Tropical Botanical Garden 2009a). In summary, on Kauai before 2003, there were eight known populations with a total of about 3,180 individuals; three of these populations had more than 500 plants. Since 2003, there have been three of the previously observed populations and one new

population surveyed with a total of about 1,750 individuals; two of these populations have more than 500 plants.

On Oahu, *Spermolepis hawaiiensis* was known from State land at Diamond Head (land leased to the Department of Defense at the Diamond Head Reservation). In 1988, when the site was first visited, thousands of individuals were seen over an area of less than 50 square meters (540 square feet), but only ten plants were observed in 1992 during the dry season. The population fluctuations probably reflect seasonal changes in precipitation. This species is known to rise and fall in numbers relative to the amount of rainfall (USFWS 2003a). In 2003, there were six clusters of *S. hawaiiensis* known on Oahu, totaling between 100 and 900 individuals, on Makua-Keaau Ridge at 244 to 305 meters (800 to 1,000 feet) and at 579 to 600 meters (1,900 to 1,969 feet) elevation (Hawaii Biodiversity and Mapping Program 2009), and near the entrance of Diamond Head (USFWS 2003a). In 2004, Joel Lau of the Hawaii Biodiversity and Mapping Program reported thousands of mature plants with additional immature plants and seedlings at Kauaopuu, at 290 to 311 meters (950 to 1,020 feet) elevation. All except two of the plants seen were on the north side of the ridge (Hawaii Biodiversity and Mapping Program 2009). Fewer than 356 individuals are reported in the Makua Military Reservation in the Punapohaku and Ohikilolo Management Units. A population with at least 354 individuals was seen on Ohikilolo Ridge at 450 to 600 meters (1,475 to 1,970 feet) in 1999 (U.S. Army Natural Resources Oahu 2009; USFWS 1999). In Lower Punapohaku in Makua, two individuals were seen in 2002 (U.S. Army Natural Resources Oahu 2009). In 2007, about 200 individuals of *S. hawaiiensis* were seen at Kamaileunu all along the cliff near *Sanicula mariversa*, another rare and endangered species in Makua (U.S. Army Natural Resources Oahu 2009). *Spermolepis hawaiiensis* is not reported in either the 2006 or 2007 Makua Implementation Plans (U.S. Army Garrison 2006, 2007b) as it was not a target species for active management (USFWS 2007). The total number of known populations on Oahu is six, with a total of at least several thousand individuals at times. Of these six populations, three were observed prior to 2003 to contain 366 to thousands of individuals, with one population containing more than 500 individuals. Since 2003, one previously known and two new populations were observed which contained thousands of individuals, with one population containing more than 500 individuals.

On Molokai, about 600 plants were reported from Kamalo on private land within an area of less than 400 square meters (0.1 acre) in 1994 (Hawaii Biodiversity and Mapping Program 2009; USFWS 1999). At Makolelau-Waiakuilani, *Spermolepis hawaiiensis* was seen at 750 meters (2,460 feet) elevation in 1997. Hundreds of individuals were seen at this location in April 2007 at 899 meters (2,950 feet) elevation and many hundreds in June 2007 at 832 meters (2,750 feet) elevation (Perlman 2008). The total number of populations on Molokai appears to be two, with two populations of at least 600 individuals observed prior to 2003 and both previously known populations containing at least many hundreds of individuals observed after 2003. It is not known whether any of these recently observed populations contain more than 500 individuals.

On Lanai, this species is known from three populations totaling 570 to 620 individuals on privately owned land in the southern edge of Kapoho Gulch and Kamiki Ridge at 350 to 400 meters (1,150 to 1,310 feet) elevation, and approximately 274 meters (900 feet) below Puu Manu at 573 meters (1,880 feet) elevation (Perlman 2008; USFWS 2003b). Each population is scattered over about an acre. The most recent confirmed observation of these populations were in 2000 (USFWS 2003b, R. Hobdy, [retired] Department of Land and Natural Resources, pers. comm. 2009).

On Maui, from 1999 to 2001, there were five known populations with hundreds to thousands of individuals on State land in the Lihau section of the West Maui Natural Area Reserve, in the Kanaio Natural Area Reserve, and on privately owned lands within the West Maui Mountains Watershed Partnership in Puu Hipa, south of Kanaha Stream, Olowalu, and Kanaio (USFWS 2003c). In 2008, the Plant Extinction Prevention Program reported seeing *Spermolepis hawaiiensis* at three locations in or near the Lihau section of the West Maui Natural Area Reserve at Puu Koai, Ukumehame Gulch, and Puu Hipa, with about two dozen individuals in each population (Hawaii Department of Land and Natural Resources 2008). Seeds were collected in April 2009 from the Kanaio Natural Area Reserve (National Tropical Botanical Garden 2009a,b). The total number of populations documented on Maui from 1999 to the present appears to be six. Since 2003, four populations were observed to contain at least 72 individuals.

On the island of Hawaii, three populations totaling about 500 individuals of *Spermolepis hawaiiensis* occurred in the U.S. Army's Pohakuloa Training Area at Kipuka Alala at 1,664 to 1,951 meters (5,460 to 6,400 feet) elevation, at Puu Anahulu, and in a kipuka within the 1859 lava flow (Hawaii Biodiversity and Mapping Program 2009; USFWS 1999). It is reportedly difficult to monitor this species because it can be absent from the field for several years at a time (Evans *et al.* 2006). After rains in 2004, following several years of drought, over 100 hours were spent surveying for *Spermolepis hawaiiensis* in Area 32 of Pohakuloa Training Area, where Kipuku Alala is located. A total of 4,835 to 5,275 individuals are growing within a fenced area (Evans *et al.* 2006; U.S. Army Garrison 2007a). The total number of populations known on Hawaii Island since 1999 is three, but only one of these populations has been observed since 2003. This population contains more than 500 plants.

Based on observations made since 2003, there are 14 populations statewide with perhaps as many as 10,200 to 10,600 individuals that are highly dependent on rainfall. If we include observations from 2000 to the present, the number could be as high as 19 populations with 12,600 to 13,100 individuals. On Kauai, four populations total approximately 1,750 individuals; on Oahu, three populations contain at least several thousand individuals; on Molokai, two populations contain at least many hundreds of individuals; on Lanai, three populations totaling 570 to 620 individuals were known in 2000; on Maui, three populations with about 72 individuals were recently observed but hundreds to thousands of individuals were seen as recently as 2001; and on the

island of Hawaii, there is one population containing 4,835 to 5,275 individuals. Between 1988 and 2003, there may have been five or more populations with more than 500 individuals statewide. Since 2003, only four of populations are documented with more than 500 individuals: two on Kauai at Nualolo Aina and Makaha, one on Oahu at Kuauopuu, and one on Hawaii island at Kipuka Alala.

On Kauai, *Spermolepis hawaiiensis* was known from *Metrosideros polymorpha* (ohia) forest and *Dodonaea viscosa* (aalii) lowland dry shrubland, at elevations between 56 and 725 meters (184 and 2,377 feet) elevation (USFWS 2003d). In Koaie Canyon, it grows on north facing mesic cliffs between Hipalau and Kawaiiki Valley, at the "great escarpment," at 610 to 671 meters (2,000 to 2,200 feet) elevation in a mixed cliff community below the forest with *Acacia koaia* (koaia), *Artemisia australis* (ahinahina), *Bidens sandvicensis* (kookoolau), *Bobea timonioides* (ahakea), *Canavalia kauaiensis* (awikiwiki), *Chamaesyce celastroides* var. *hanapepensis* (akoko), *Chenopodium oahuense* (aheahea), *Dicranopteris linearis* (uluhe), *Diospyros hillebrandii* (lama), *Doryopteris decora* (no common name [NCN]), *Eragrostis variabilis* (kawelu), *Flueggea neowawraea* (mehamehame), *Hibiscadelphus distans* (hau kuahiwi), *Hibiscus waimeae* ssp. *waimeae* (kokio keokeo), *Lipochaeta connata* var. *acris* (nehe), *Lobelia niihauensis* (NCN), *Metrosideros polymorpha* var. *glaberrima* (ohia), *Munroidendron racemosum* (NCN), *Myrsine lanaiensis* (kolea), *Neraudia melastomifolia* (maaloa), *Nesoluma polynesicum* (keahi), *Nototrichium sandwicense* (kului), *Panicum beecheyi* (NCN), *Panicum lineale* (NCN), *Plectranthus parviflorus* (ala ala wai nui pua ki), *Pleomele aurea* (hala pepe), *Pouteria sandwicensis* (alaa), *Pteralyxia kauaiensis* (kaulu), *Santalum freycinetianum* var. *pyrularium* (iliahi), *Schiedea spergulina* (NCN), *Selaginella arbuscula* (lepe lepe a moa), and *Sida fallax* (ilima) (Hawaii Biodiversity and Mapping Program 2009; Wood 2009). In Waimea Canyon, *S. hawaiiensis* grows in *Diospyros sandwicensis* dry forest with *Acacia koa*, *Alectryon macrococcus* var. *macrococcus* (mahoe), *Artemisia australis*, *Bobea timonioides*, *Doryopteris decora*, *Eragrostis variabilis*, *Flueggea neowawraea*, *Metrosideros polymorpha*, *Nestegis sandwicensis* (olopua), *Nothocestrum peltatum* (aiea), *Pleomele aurea*, *Psydrax odorata* (alahee), *Pteralyxia kauaiensis*, *Rauvolfia sandwicensis* (hao), and *Xylosma* sp. (maua) (Perlman 2008). Near Hanapepe, in Kapahili Gulch, *S. hawaiiensis* grows in *Dodonaea viscosa* mixed lowland shrubland with *Doryopteris decora*, *Heteropogon contortus* (pili grass), *Lipochaeta connata*, *Panicum torridum* (kakonakona), *Panicum* cf. *pellitum* (kaioio), *Peperomia blanda* (ala ala wai nui), *Plumbago zeylanica* (iliee), *Santalum ellipticum* (iliahialoe), and *Sicyos herbstii* (anunu) (Wood 2009). In Poomau Canyon, *S. hawaiiensis* grows in steep mesic forests above Poomau Stream, with *Aleurites moluccana* (kukui), *Bobea timonioides*, *Diospyros* sp., *Doryopteris decora*, *Flueggea neowawraea*, *Psychotria* spp. (kopiko), and *Tetraplasandra* sp. (ohe) (Wood 2009). At the end of Milolii Road, *S. hawaiiensis* grows in steep, dry *Myoporum sandwicense* (naio) degraded basalt cliff habitat with *Chrysopogon aciculatus* (manienie ula), *Doryopteris decipiens*, and *Heteropogon contortus* (Wood 2009). At Makaha Ridge, *S. hawaiiensis* grows on *Myoporum sandwicense* dry cliffs with *Artemisia australis*, *Dodonaea viscosa*, *Doryopteris decipiens*, *Eragrostis variabilis*, *Heteropogon contortus*, *Panicum*

torridum, *Psilotum nudum* (moa), *Selaginella arbuscula*, *Sida fallax*, and *Wilkesia hobdyi* (dwarf iliau) (Wood 2009). In Kaaweiki, *S. hawaiiensis* was found at 360 to 378 meters (1,180 to 1,240 feet) elevation in habitat that was mostly introduced species with *Chamaesyce* sp., *Dodonaea viscosa*, *Myoporum sandwicense*, and *Sida fallax* (Perlman 2008). Nualolo Aina is a dry coastal valley with primarily alien vegetation and *Myoporum sandwicense* (National Tropical Botanical Garden 2009a).

On Lanai, *Spermolepis hawaiiensis* is known from gulch slopes and ridge tops in *Diospyros sandwicensis – Nestegis sandwicensis* dry forest or shrub lands dominated by *Dodonaea viscosa* between 402 and 711 meters (1,319 and 2,332 feet) elevations. Associated native plant species include *Myrsine lanaiensis*, *Nesoluma polynesicum*, *Psydrax odorata*, *Rauvolfia sandwicensis*, and *Wikstroemia* sp. (akia) (Perlman 2008; USFWS 2003b).

Spermolepis hawaiiensis on Oahu typically grows on steep to vertical cliffs or at the base of cliffs and ridges in coastal dry cliff vegetation at 25 to 306 meters (82 to 1,004 feet) elevation. Associated native plant species include *Artemisia australis*, *Bidens torta* (kookoolau), *Dodonaea viscosa*, *Doryopteris* sp., *Dubautia herbstobatae* (naenae), *Eragrostis variabilis*, *Heteropogon contortus*, *Lipochaeta tenuifolia* (nehe), *Lobelia niihauensis* (NCN), *Metrosideros* sp., *Santalum ellipticum*, *Tetramolopium filiforme* (NCN), and *Waltheria indica* (uhaloa) (Perlman 2008; USFWS 2003a, 2007).

Spermolepis hawaiiensis on Maui is known from shady spots in *Dodonaea viscosa* lowland dry shrubland at 221 and 742 meters (725 and 2,434 feet) elevation and with associated native species including *Bidens menziesii* (kookoolau), *Diospyros* spp., *Eragrostis variabilis*, *Erythrina sandwicensis* (wiliwili), *Gouania hillebrandii* (NCN), *Heteropogon contortus*, *Lipochaeta rockii* (nehe), *Melanthera lavarum* (nehe), *Myoporum sandwicense*, *Pleomele* spp., *Santalum ellipticum*, *Sida fallax*, and *Wikstroemia* spp. (Perlman 2008; USFWS 2003c).

On Molokai, *Spermolepis hawaiiensis* grows in *Dodonaea viscosa – Leptecophylla tameiameiae* (pukiawe) shrubland with *Bidens menziesii*, *Chamaesyce* sp., *Coprosma* sp. (pilo), *Dubautia linearis* subsp. *opposita* (naenae), *Lepidium bidentatum* var. *o-waihiense* (anaunau), *Lipochaeta rockii*, *Nestegis sandwicensis*, *Osteomeles anthyllidifolia* (ulei), *Pittosporum argentifolium* (hoawa), *Pleomele aurea*, *Schiedea lydgatei* (NCN), *Sida fallax*, *Streblus pendulinus* (aiai), *Viola chamissoniana* (pamakani), and *Wikstroemia* sp. (Perlman 2008). It is also found along coastal strand at Kalaupapa peninsula (G. Hughes, Kalaupapa National Historical Park, pers. comm. 2009).

On the island of Hawaii, *Spermolepis hawaiiensis* grows in *Myoporum sandwicense – Sophora chrysophylla* (mamane) forest (Hawaii Biodiversity and Mapping Program 2009). Rare native plants in that area include *Asplenium peruviana* var. *insulare* (NCN), *Kadua coriacea* (kioele), *Portulaca sclerocarpa* (poe), *Silene hawaiiensis*

(NCN), *S. lanceolata* (NCN), *Stenogyne angustifolia* (NCN), *Tetramolopium* sp. (NCN), and *Zanthoxylum hawaiiense* (ae) (Evans *et al.* 2006).

The primary threats to *Spermolepis hawaiiensis* on Kauai are habitat degradation and competition with various invasive introduced plants (Factor E) such as *Abutilon grandifolium* (hairy abutilon), *Ageratum conyzoides* (billy goat weed), *Anagallis arvensis* (scarlet pimpernel), *Erigeron karvinskianus* (daisy fleabane), *Boerhavia coccinea* (NCN), *Bothriochloa pertusa* (pitted beardgrass), *Bromus hordeaceus* (soft chess), *Bryophyllum pinnatum* (airplant), *Chamaecrista nictitans* (partridge pea), *Hyptis pectinata* (comb hyptis), *Indigofera suffruticosa* (indigo), *Lantana camara* (lantana), *Melia azedarach* (pride of India), *Melinis repens* (Natal redtop), *Opuntia ficus-indica* (prickly pear cactus), *Pluchea carolinensis* (marsh fleabane), *Polycarpon tetraphyllum* (NCN), *Setaria parviflora* (yellow foxtail), *Triumfetta semitriloba* (Sacramento bur), *Verbena litoralis* (vervain), and *Vulpia bromoides* (brome fescue). Feral goats and soil erosion, disturbance of substrate, landslides, and rock slides due to natural weathering (Factor E) and feral goat activity (Factor A) result in the death of individual plants as well as habitat destruction. Fire (Factor E) is also a potential threat (National Tropical Botanical Garden 2009a; Perlman 2008; USFWS 2003d; Wood 2009).

The primary threats to *Spermolepis hawaiiensis* on Lanai are habitat degradation by axis deer (*Axis axis*) (Factor A), competition with various invasive introduced plants (Factor E), such as *Lantana camara*, *Leucaena leucocephala* (haole koa), *Morella faya* (firetree), and *Psidium* spp. (guava); and erosion, landslides, and rockslides due to natural weathering (Factor E), which result in the death of individual plants as well as habitat destruction (USFWS 2003b).

The primary threats to *Spermolepis hawaiiensis* on Oahu are habitat degradation by feral goats (*Capra hircus*) (Factor A); competition with nonnative plant species (Factor E) such as *Lantana camara*, *Melinis minutiflora* (molasses grass), *Schinus terebinthifolius* (Christmas berry), *Ageratina riparia* (spreading mist flower), *Bryophyllum pinnatum*, and various grasses; habitat destruction and death of plants due to erosion, landslides, rock slides resulting from natural weathering (Factor E); and wild fires from military training-related activity (Factor E), as some *Spermolepis hawaiiensis* occur within the high fire risk zone (Perlman 2008; USFWS 1999, 2003a, 2007). In July 2009, a fire east of Makua cave that began near Farrington Highway burned up to the base of a cliff that contained several endangered plant species, including *S. hawaiiensis* (U.S. Army Garrison 2009).

The primary threats to *Spermolepis hawaiiensis* on Maui are habitat degradation by feral goats, pigs (*Sus scrofa*), cattle (*Bos taurus*), and axis deer (Factor A); competition with various invasive introduced plants (Factor E), such as *Opuntia ficus-indica*, *Pennisetum clandestinum* (fountain grass), *Lantana camara*, and *Melinis repens;* fire (Factor E); and erosion, landslides, and rock slides caused by natural weathering (Factor E), which result in the death of individual plants as well as habitat destruction (Perlman 2008; USFWS 2003c).

Climate change may also pose a threat to *Spermolepis hawaiiensis* (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.

Threats on Molokai include invasive introduced plants (Factor E) such as *Melinis minutiflora* and *Lantana camara* (Perlman 2008), and deer and horses (*Equus caballus*) (Factor A) at Kalaupapa peninsula.

Threats on the island of Hawaii have been ungulates (Factor A), for which exclusionary fencing has been erected. Threats to *Spermolepis hawaiiensis* on Hawaii also include fires resulting from military activities on the Pohakuloa Training Area (Factor E), and introduced invasive plants (Factor E) including Russian thistle (*Salsola kali*), *Passiflora tarminiana* (banana poka), and fountain grass (*Pennisetum setaceum*) (Evans *et al.* 2006; U.S. Army Garrison 2007a; USFWS 1999).

In the Ohikilolo Management Unit of the Makua Military Reservation on Oahu, the Army reports doing weed control some years ago around *Spermolepis hawaiiensis*, although it is more focused on two other endangered species in the area, *Chamaesyce celastroides* var. *kaenana*, and *Hibiscus brackenridgei* subsp. *mokuleianus* (U.S. Army Garrison 2005). *Spermolepis hawaiiensis* is not known to have been recently collected, propagated or outplanted on Oahu. The majority of seed collections for storage and reintroduction are from the Pohakuloa Training Area populations on Hawaii Island; small seed collections have been made from Kauai, Maui, and Molokai. From 2003 to 2005, seeds provided to Hawaii Volcanoes National Park was increased to 28,000 seeds, 24,000 of which were used for a seed broadcast experiment in 2005 (Evans *et al.* 2006; Hawaii Volcanoes National Park 2006). Germination of the broadcast seeds was observed by 2006 (Hawaii Volcanoes National Park 2006). From 2006 to 2009, seeds representing approximately 50 parent individuals were broadcast at three sites in the National Park Naulu, Kipuka Kahalii, and Hilina Pali and the remaining propagation material is being used to produce seed (Hawaii Volcanoes National Park 2007, 2008, 2009). The U.S. Army at Pohakuloa Training Area has been collecting seeds for the past two years and currently has 70 seeds from five wild individuals (U.S. Army 2009). The Volcano Rare Plant Facility on the island of Hawaii currently has 1,000 seeds from the Pohakuloa Training Area (Volcano Rare Plant Facility 2009). The Center for Conservation Research and Training Seed Storage Facility reports having 1,714 seeds in storage collected from Pohakuloa, Hawaii (640 seeds) and Waiakuilani, Molokai (1,074 seeds) (Volcano Rare Plant Facility 2006; Center for Conservation Research and Training Seed Storage Facility 2008). On Kauai, the National Tropical Botanical Gardens has in long term storage at least 28 seeds from Kaaweiki Ridge, Makaha Ridge, and Nualolo Aina on Kauai, and 100 seeds from Kanaio on East Maui (National Tropical Botanical Garden 2009a,b). Maui Nui Botanical Garden has 40 seeds in storage from Lihau, West Maui (Maui Nui Botanical Garden 2009).

The downlisting criteria for this species have not been met as there are only four populations documented to contain more than 500 individuals and not all threats are

being managed (see Table 1). Therefore, *Spermolepis hawaiiensis* 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*
__X__ 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

- Collect seed and propagate this and other associated species for reintroduction.
- Utilize techniques for protecting soil stability from grazing animals where necessary.
- Reintroduce or broadcast seed within protected suitable habitat.
- Research possible predation of seedlings by arthropods.
- Monitor populations to assess population stability, to determine whether the species warrants downlisting in five years.
- Work with the National Park Service, U.S. Army, and other landowners to initiate planning and contribute to implementation of ecosystem-level restoration and management to benefit this species.

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Signature Page
U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW of *Spermolepis hawaiiensis* / (no common name)

Current Classification: _____E_____

Recommendation resulting from the 5-Year Review:

____ Downlist to Threatened
____ Uplist to Endangered
____ Delist
__X_ 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 2 7 2010
for **Field Supervisor, Pacific Islands Fish and Wildlife Office**