# *Sanicula purpurea*
# (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:** *Sanicula purpurea*/ no common name

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# 5-YEAR REVIEW
# *Sanicula purpurea* (no common name)

## 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 March 16, 2009. The review was based on final critical habitat designations for *Sanicula purpurea* and other species from the islands of Maui and Oahu (USFWS 2003a, b) 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 Samuel Aruch, biological consultant, was reviewed by the Plant Recovery Coordinator. The document was then reviewed by the Recovery Program Lead and the Assistant Field Supervisor for Endangered Species before submission to the Deputy Field Supervisor for approval.

### 1.3 Background:

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

[USFWS] U.S. Fish and Wildlife Service. 2009. Endangered and threatened wildlife and plants; initiation of 5-year reviews of 103 species in Hawaii. Federal Register 74(49):11130-11133.

### 1.3.2 Listing history

Original Listing
**FR notice:** USFWS. 1996. Endangered and threatened wildlife and plants; determination of endangered or threatened status for fourteen plant taxa from the Hawaiian Islands, Hawaii; final rule. Federal Register 61(198):53108-53124.
**Date listed:** October 10, 1996
**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 rulemakings:

USFWS. 2003a. 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. 2003b. Endangered and threatened wildlife and plants; final designations or nondesignations of critical habitat for 101 plant species from the island of Oahu, Hawaii; final rule. Federal Register 68(116):35949-36406.

Critical habitat was designated for *Sanicula purpurea* in three units totaling 348 hectares (858 acres) on the island of Maui. This designation includes habitat on Federal lands (USFWS 2003a). Critical habitat was designated for *Sanicula purpurea* in a single unit totaling 701 hectares (1,732 acres) on the island of Oahu. This designation includes habitat on State, Federal, and private lands (USFWS 2003b).

### 1.3.4 Review History:

Species status review [FY 2010 Recovery Data Call (September 2010)]: Declining

**Recovery achieved:**
1 (0-25%) (FY 2007 Recovery Data Call – most recent year 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**: U.S. Fish and Wildlife Service. 1999. Recovery plan for multi-island plants. U.S. Fish and Wildlife Service, Portland, Oregon. 206 pages + 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 (Listing Factors A, C, D, and E) affecting this species is presented in section 2.3.2 and Table 2. Listing 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 multi-island plant recovery plan (USFWS 1999), based on whether the species is an annual, a short-lived perennial (fewer than 10 years), or a long-lived perennial. *Sanicula purpurea* 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 islands 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.

There are only two confirmed populations that may contain more than 50 individuals of *Sanicula purpurea* (Table 1) and all threats have not been managed (Table 2). This recovery objective has not been met.

For downlisting, a total of five to seven populations of *Sanicula purpurea* 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 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 *Sanicula purpurea* 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 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

*Sanicula purpurea* was originally listed as endangered in 1996.

### 2.3.1 Biology and Habitat

#### 2.3.1.1 New information on the species' biology and life history:

*Sanicula purpurea* is monocarpic, which means it flowers only once before it dies. A large number of individuals contained within each population of *Sanicula purpurea* may not flower simultaneously in any given year due to their monocarpic (flower once and then die) nature. Although, plants within the same population, have been found flowering and fruiting throughout the year. This species is presumably pollinated by insects. The bristles on its fruit suggest bird's aid in dispersing seeds. This species is a short-lived perennial and may lose its leaves periodically (U.S. Army Garrison 2008a).

#### 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**:

*Sanicula purpurea* is known from West Maui and the Koolau Mountains of Oahu. The numbers of individuals are difficult to census because the plants are small and often hidden in the surrounding vegetation. Also, it is difficult to know what constitutes a single individual, as some plants lose their leaves and are not visible above ground. Because of this, the numbers recorded in a given colony from year to year change, and may not reflect the true population census of the colony (U.S. Army Garrison 2008a). This species may also form patches, and large individuals may branch and root at the nodes, making an accurate inventory of individuals difficult, especially in fragile bog habitats on West Maui (Oppenheimer 2010).

On Oahu, it occurs only on the summit ridge of the Koolau Mountains, at 700 to 957 meters (2,300 to 3,140 feet) elevation (U.S. Army Garrison 2008a). It occurs on military lands in three management units: Poamoho, Opaeula, and South Kaukonahua. These populations comprise of about 4 mature and 56 immature individuals, while there are just 5 individuals known south of the training area (U.S. Army Garrison 2008a). Eight individuals were observed in 2000 at the North Kaukonahua-Punaluu summit ridge at 799 meters (2,620 feet) elevation (Hawaii Biodiversity and Mapping Program 2009). Three individuals were observed in 2007 on the hill by the junction of Schofield Waikane and Summit Trail at 701 meters (2,300 feet) elevation (Perlman 2010; Wood 2010). At Puu Pauao, south of Poamoho Trail, four individuals were seen at 768 meters (2,520 feet) elevation in 1995 and five plants were observed at 777 meters (2,550 feet) elevation in 2001 (National Tropical Botanical Garden 2009; Perlman 2010). Four individuals were seen in 2007 at Waiawa, also on the Koolau Mountain summit crest at 762 meters (2,500 feet) elevation (Perlman 2010).

On West Maui, the species has been recorded in montane bogs and wet shrublands near bogs from 1,341 to 1,707 meters (4,400 to 5,600 feet) elevation (Oppenheimer 2010). On Puu Kukui, *Sanicula purpurea* was seen in the Violet Lake area silversword bog from 1,486 to 1,646 meters (4,875 to 5,500 feet) elevation during the period of 1987 through 1999. Oppenheimer observed *Sanicula purpurea* along the Puu Kukui Trail at the silversword bog in 2009; in 1998 it was noted in several areas within one

kilometer of the Puu Kukui Trail and boardwalk (Perlman 2010). At Panaewa Natural Area Reserve a few scattered plants in bogs were observed in 1988, on the eastern ridge of Kahakuloa at about 1,341 meters (4,400 feet) elevation (Perlman 2010; Wood 2010). At Kahoolewa Ridge, west of Puu Kane up to East Bog and Liliwai Bog, about 50 individuals were observed in 1997 and 1998 at 1,460 to 1,737 meters (4,800 to 5,700 feet) elevation (Perlman 2010; Wood 2010).

Currently, on Oahu there are approximately 80 individuals within 6 populations and around 50 individuals within 4 populations located on West Maui. However, estimates for West Maui are based on surveys conducted over ten years ago.

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

No new information.

**2.3.1.4 Taxonomic classification or changes in nomenclature**:

No new information

**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.)**:

*Sanicula* pollen has been reported from prehistoric pollen deposits in Pepeopae Bog on Molokai. It seems likely that this pollen is from *S. purpurea*, given the habitats and Molokai's position between Oahu and West Maui in the island chain (U.S. Army Garrison 2008a).

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

In the Koolau Mountains, *Sanicula purpurea* occurs on exposed ridges in bog-like vegetation containing ground-covering bryophytes (mosses and liverworts), native shrubs, ferns, herbs, sedges, and grasses. At Kaipapau and Kawainui Gulches on the

windward side of the summit ridge, the habitat is sloping open bog. Associated native plant species in the Koolau Mountains include *Metrosideros polymorpha* (ohia lehua), *Metrosideros rugosa* (lehua papa), *Bidens macrocarpa* (kookoolau), *Cheirodendron trigynum* (olapa), *C. platyphyllum* (lapalapa), *Cyrtandra paludosa* (moa), *Dichanthelium koolauense* (no common name [NCN]), *Dicranopteris linearis* (uluhe), *Dubautia laxa* (naenae pua melemele), *Isachne distichophylla* (ohe), *Kadua affinis* (manono), *Labordia* sp. (kamakahala), *Leptecophylla tameiameiae* (pukiawe), *Lobelia gaudichaudii* (NCN), *Machaerina angustifolia* (uki), *Phyllostegia lantanoides* (NCN), *Plantago pachyphylla* (laukahi kuahiwi), *Sadleria cyatheoides* (amau), *S. pallida* (amau ii), *Trematolobelia singularis* (NCN), *Vaccinium calycinum*, (ohelo), *V. dentatum* (ohelo), *Viola kauaensis* (pohe hiwa), and *Wikstroemia oahuensis* (akia) (National Tropical Botanical Garden 2009; Perlman 2010; U.S. Army Garrison 2008a; Wood 2010).

On West Maui, *Sanicula purpurea* occurs in open montane bogs dominated by *Metrosideros polymorpha* (ohia) and native sedges (U.S. Army Garrison 2008a). Habitats are *Metrosideros polymorpha – Oreobolus furcatus* bogs, *Metrosideros polymorpha – Cheirodendron trigynum* montane wet shrublands, and windswept bogs with patches of forest along streams. Associated species include *Acaena exigua* (liliwai), *Adenophorus* sp., *Argyroxiphium caliginis* (Eke silversword), *A. grayanum* (greensword), *Astelia menziesiana* (painiu), *Athyrium microphyllum* (akolea), *Broussaisia arguta* (kanawao), *Carex alligata* (NCN), *Carex montis-eeka* (NCN), *Cheirodendron trigynum* (olapa), *Cibotium* sp. (hapuu), *Clermontia grandiflora* (oha wai), *Coprosma ochracea* (pilo), *Cyanea kunthiana* (haha), *Deschampsia nubigena* (hairgrass), *Dicranopteris linearis*, *Dubautia laxa*, *Dryopteris glabra* (kilau), *Eragrostis grandis* (lovegrass), *Eurya sandwicensis* (anini), *Freycinetia arborea* (ie ie), *Gahnia beecheyi* (NCN), *Geranium hillebrandii* (nohoanu), *Huperzia mannii* (NCN), *Ilex anomala* (kawau), *Labordia* sp. (kamakahala), *Lagenifera maviensis* (howaiaulu), *Leptecophylla tameiameiae*, *Lobelia gloria-montis* (NCN), *Lycopodiella cernua* (wawaeiole), *Lycopodium venustulum* (NCN), *Melicope clusiifolia* (kolokolo mokihana), *M. orbicularis* (alani), *Myrsine vaccinioides* (kolea), *Nertera granadensis* (makole), *Peperomia* sp. (ala ala wai nui), *Plantago pachyphylla*, *Rhynchospora* sp., *Sadleria* sp., *Schizaea robusta* (haili o Pua), *Selaginella* sp., *Stenogyne* sp., *Vaccinium calycinum*, *Viola maviensis* (NCN),

and *Wikstroemia bicornuta* (akia) (Hawaii Biodiversity and Mapping Program 2009; National Tropical Botanical Garden 2009; Oppenheimer 2010; Perlman 2010; Wood 2010)

**2.3.1.7 Other**:

No new information.

### 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:

The *Sanicula purpurea* sites in the Koolau Mountains have been invaded to various extents by the invasive narrow-leaved carpetgrass (*Axonopus fissifolius*), and in some cases that has become the dominant species. On Oahu, other invasive introduced plant species include *Clidemia hirta* (Koster's curse), *Sacciolepis indica* (Glenwood grass), and *Pterolepis glomerata* (NCN) (U.S. Army Garrison 2008a).

On West Maui, the bog habitat of *Sanicula purpurea* is still mostly native in composition, but invasive introduced plant species including *Juncus effusus* (Japanese mat rush), *J. planifolius* (bog rush), and *Tibouchina herbacea* (glorybush) are found occasionally. Feral pigs (*Sus scrofa*) are potentially a threat to *S. purpurea* and its bog habitats on West Maui, but an effective control program has reduced their impact (U.S. Army Garrison 2008a; Wood 2010).

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

Not a threat.

#### 2.3.2.3 Disease or predation:

Rats (*Rattus* sp.) and slugs (unidentified species) have been recorded to consume this species (Perlman 2010).

#### 2.3.2.4 Inadequacy of existing regulatory mechanisms:

No new information.

#### 2.3.2.5 Other natural or manmade factors affecting its continued existence:

The introduced invasive plant species discussed in section 2.3.2.1 above are also a threat to *Sanicula purpurea* because they compete with the species for water, light, and nutrients.

Trampling by humans and feral ungulates within the bogs are a threat to the Maui populations of *Sanicula purpurea* (Oppenheimer 2010).

Climate change may also pose a threat to this species. However, current climate change analyses in the Pacific Islands lack sufficient spatial resolution to make predictions on impacts to this species. The Pacific Islands Climate Change Cooperative has currently funded climate modeling that will help resolve these spatial limitations. We anticipate high spatial resolution climate outputs by 2013.

Two accessions totaling 36 seeds of *Sanicula purpurea* are held at the Center for Conservation Research and Training Seed Storage Facility at Lyon Arboretum (Center for Conservation and Research Training Seed Storage Facility 2009). In 2008, the U.S. Army reported having 109 seeds in storage, and attempted reintroductions of four individuals at Helemano-Opaeula (U. S. Army Garrison 2008b).

Maui Land and Pineapple Company constructed a 2-mile long section of boardwalk through the bog habitat along the Puu Kukui Trail which protects *Sanicula purpurea* from trampling by humans (Oppenheimer 2010). Habitat on West Maui is fenced and intensive ungulate control is occurring in the area (USFWS 1999).

## 2.4 Synthesis

Stabilizing, downlisting, and delisting objectives are provided in the multi-island plant recovery plan (USFWS 1999), based on whether the species is an annual, a short-lived perennial (fewer than ten years), or a long-lived perennial. *Sanicula purpurea* 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) 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. For the species to be considered stable, each of these populations must be naturally reproducing and increasing in number, with a minimum of 50 mature individuals per population.

The interim stabilization goals for this species have not been met as there are only two confirmed populations of more than 50 individuals (Table 1) and all threats have not been managed (Table 2). Therefore, *Sanicula purpurea* meets the definition of endangered as it remains in danger of extinction throughout its range.

**Table 1. Status of *Sanicula purpurea* from listing through 5-year review**.

| Date | No. wild indivs | No. outplanted | Stability Criteria identified in Recovery Plan | Stability Criteria Completed? |
|---|---|---|---|---|
| 1996 (listing) | 130-210 | 0 | All threats managed in all 3 populations | No |
| | | | Complete genetic storage | No |
| | | | 3 populations with 50 mature individuals each | No |
| 1999 (recovery plan) | 181-261 | 0 | All threats managed in all 3 populations | No |
| | | | Complete genetic storage | No |
| | | | 3 populations with 50 mature individuals each | No |
| 2003 (critical habitat) | 221 | 0 | All threats managed in all 3 populations | Partially |
| | | | Complete genetic storage | Partially |
| | | | 3 populations with 50 mature individuals each | No |
| 2010 (5-year review) | 130 | 0 | All threats managed in all 3 populations | Partially (Table 2) |
| | | | Complete genetic storage | Partially |
| | | | 3 populations with 50 mature individuals each | No: only 2 populations with 50 individuals |

**Table 2. Threats to *Sanicula purpurea*.**

| Threat | Listing factor | Current Status | Conservation/ Management Efforts |
|---|---|---|---|
| Ungulates – habitat modification and herbivory | A, C, D | Ongoing | Partially: populations and habitat in West Maui are fenced and ungulates controlled |
| Rats – herbivory | C | Ongoing | No |
| Slugs – herbivory | C | Ongoing | No |
| Trampling by hikers | E | Ongoing | Partially: boardwalk keeps hikers on trail |
| Invasive introduced plants | A, E | Ongoing | No |
| Climate change | A, E | Increasing | No |

## 3.0 RESULTS

### 3.1 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

- Monitor known populations and collect any available seeds for genetic storage and reintroduction.

- Maintain the fences around existing populations to provide protect from the negative impacts of ungulates.

- Control invasive introduced species around known populations.

- Control rats in the vicinity of these populations.

- Develop and implement methods to control slugs.

- Propagate to augment the existing populations.

- Establish additional populations within protected suitable habitat.

- Survey West Maui populations for current status, as the last observations were made a decade or more ago.

- Research life-cycle aspects of the species that affect seed production and regeneration.

- Work with Maui Land and Pineapple Company, Hawaii Division of Forestry and Wildlife, U.S. Army Garrison Hawaii, and other land managers to initiate planning and contribute to implementation of ecosystem-level restoration and management to benefit this species.

- Assess the modeled effects of climate change on this species, and use to determine future landscape needed for the recovery of the species.

## 5.0 REFERENCES

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

**Pre-1996 DPS listing still considered a listable entity?** N/A

**Recommendation resulting from the 5-year review:**

_____ Delisting
_____ Reclassify from Endangered to Threatened status
_____ Reclassify from Threatened to Endangered status
__X__ No Change in listing status

**Appropriate Listing/Reclassification Priority Number, if applicable:** _____

**Review Conducted By:**
Chelsie Javar, Fish and Wildlife Biologist
Marie Bruegmann, Plant Recovery Coordinator
Jess Newton, Recovery Program Lead
Assistant Field Supervisor for Endangered Species

**Field Supervisor, Pacific Islands Fish and Wildlife Office**

_____ Date 8/3/17