# Santa Cruz Island bushmallow
# *Malacothamnus fasciculatus* var. *nesioticus*

## 5-Year Review:
## Summary and Evaluation

***photo by: Kathryn McEachern, USGS - BRD***

**U.S. Fish and Wildlife Service**
**Ventura Fish and Wildlife Office**
**Ventura, California**

**September 2007**

# 5-YEAR REVIEW

## Santa Cruz Island bushmallow
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## I. GENERAL INFORMATION

Santa Cruz Island bushmallow, *Malacothamnus fasciculatus* var. *nesioticus*, is a small soft-woody shrub in the mallow (Malvaceae) family. It grows up to 2 meters (6 feet) tall, with slender branches, palmate leaves, and rose-colored flowers. This endemic variety is currently known from only four small populations on Santa Cruz Island, in the northern Channel Islands of southern California, where it occurs on rocky, south facing slopes in chaparral and coastal scrub vegetation types (Service 2000).

### I.A. Reviewers

**Lead Regional Office:** California/Nevada Operations Office

Diane Elam, Deputy Division Chief for Listing, Recovery, and Habitat Conservation Planning, and Jenness McBride, Fish and Wildlife Biologist; 916-414-6464

**Lead Field Office:** Ventura Fish and Wildlife Office

Della Snyder, Biologist, 626-574-5254
Connie Rutherford, Recovery Coordinator (Plants), 805-644-1766, ext. 306

### I.B. Methodology used to complete the review

This review was conducted by staff in the U.S. Fish and Wildlife Service (Service), Ventura Fish and Wildlife Office, Ventura, California. The review is based on the following: information available in current published and unpublished literature; discussions with other agency biologists; discussions with species experts; information available on the internet; and the Ventura Fish and Wildlife Office species files. An unpublished report by the U.S. Geological Survey-Biological Resources Division (USGS-BRD) was the primary source for information on current population trends, newly discovered populations, current threats, and current projects that are focused on species recovery. We received no response to our Federal Register (FR) notice initiating a request for information on this species (see section I.C.1, below).

## I.C. Background

### I.C.1. FR Notice citation announcing initiation of this review:

The initial FR notice was published on March 22, 2006 (71 FR 14538) and initiated a 60-day request for information. A second FR notice was published on April 3, 2006 (71 FR 16584) that clarified the contact office.

### I.C.2. Listing history

Original Listing
FR notice: 62 FR 40954
Date listed: July 31, 1997
Entity listed: variety (*Malacothamnus fasciculatus* var. *nesioticus*)
Classification: Endangered

### I.C.3. Associated rulemaking:

None

### I.C.4. Review History

No comprehensive status review has been conducted for this species since the recovery plan (which does not specifically include a five-factor analysis).

**I.C.5. Species' Recovery Priority Number at start of review:** 3. This denotes a subspecies facing a high degree of threat with a high recovery potential.

### I.C.8. Recovery Plan or Outline

**Name of plan:** Thirteen Plant Taxa from the Northern Channel Islands Recovery Plan.

**Date issued:** September 26, 2000.

**Dates of previous revisions, if applicable:** None.

# II. REVIEW ANALYSIS

## II.A. Application of the 1996 Distinct Population Segment (DPS) policy

### II.A.1. Is the species under review listed as a DPS?

The Endangered Species Act (Act) defines species as including any subspecies of fish or wildlife or plants, and any distinct population segment of any species of vertebrate

wildlife. This definition limits listings as distinct population segments (DPS) only to vertebrate species of fish and wildlife. Because the species under review is a plant and the DPS policy is not applicable, the application of the DPS policy to the species listing is not addressed further in this review.

## II.B. Recovery Criteria

### II.B.1. Does the species have a final, approved recovery plan containing objective, measurable criteria?

__X__ **Yes**
____ **No**

### II.B.2. Adequacy of recovery criteria.

#### II.B.2.a. 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**

#### II.B.2.b. Are all of the 5 listing factors that are relevant to the species addressed in the recovery criteria (and note any new information to consider regarding existing or new threats)?

__X__ **Yes**
____ **No**

While the recovery criteria are not explicitly based on the five factors, they are generally addressed in the criteria.

### II.B.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. For threats-related recovery criteria, please note which of the 5 listing factors* are addressed by that criterion. If any of the 5-listing factors are not relevant to this species, please note that here.

The recovery plan that includes *Malacothamnus fasciculatus* var. *nesioticus* contains generalized downlisting criteria for a suite of 13 species that occur on the

* A) Present or threatened destruction, modification or curtailment of its habitat or range;
B) Overutilization for commercial, recreational, scientific, or educational purposes;
C) Disease or predation;
D) Inadqequacy of existing regulatory mechanisms;
E) Other natural or manmade factors affecting its continued existence.

northern Channel Islands. The following downlisting goal is applicable to all herbaceous species:

Secure populations of a minimum of 2,000 individuals (addresses Listing Factors A, C, and E). This criterion has not been met. We believe this criterion is not appropriate given the limited number of genotypes that have been detected within the existing populations (see section II.C.2, below).

Downlisting criteria specific to *Malacothamnus fascifulatus* var. *nesioticus* were also included as follows:

1) Establish five viable populations on Santa Cruz Island (addresses Listing Factors A, C, and E.) Only four populations are known at this time. Although surveys in historical and other suitable habitat have been conducted, other populations have not been found. In addition, no reintroduced populations have been established. Therefore, this criterion has not been met. We believe this criterion is adequate and appropriate with respect to the recovery of the species.

2) Maintain populations as stable or increasing with evidence of natural recruitment for a period of 15 years that includes the normal precipitation cycle (addresses Listing Factors A, C, and E). Because the species has not been listed for a minimum of 15 years, this criterion has not been met. We believe this criterion is adequate and appropriate with respect to the recovery of the species.

In the recovery plan, general delisting criteria for the suite of 13 covered plants involves increasing the number of populations either through surveying historical sites and potential habitat within the historical range to locate currently unknown populations, or repatriating or introducing several additional populations of the species. Delisting criteria specific to *Malacothamnus fasciculatus* var. *nesioticus* comprise the following*:*

1) Discover or establish five additional populations (addresses Listing Factors A, C, and E). This criterion has not been met.

2) No decline after downlisting for 10 years (addresses Listing Factors A, C, and E). This criterion has not been met. Although we believe the intent of this criterion is appropriate, we think it should be refined in the future to focus more on long-term trends, rather than a short-term, absolute decline, once additional information about the life history of the species and its response to recovery actions are better understood.

Factors B and D are not relevant to this taxon.

## II.C. Updated Information and Current Species Status

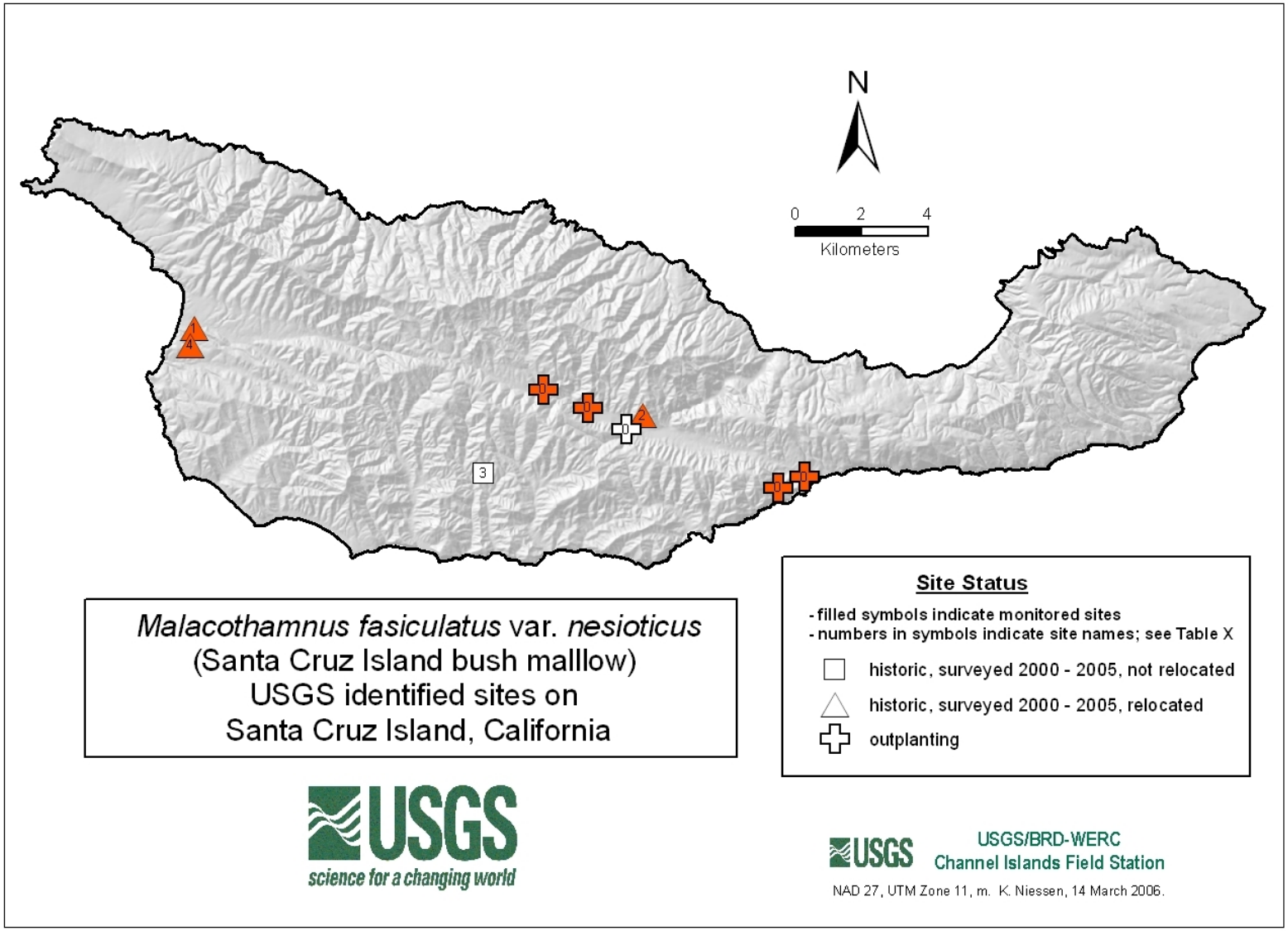
### 1. Distribution:

*Malacothamnus fasciculatus* var. *nesioticus* is endemic to Santa Cruz Island and is known from only four localities. Approximately 24 percent of Santa Cruz Island is owned and managed by Channel Islands National Park (NPS) and the remaining 76 percent of the island is owned by The Nature Conservancy (TNC). All four Santa Cruz Island bushmallow localities (see USGS map, p. 6) are on lands owned by TNC, which has entered into a cooperative agreement with NPS to manage Santa Cruz Island as a single ecological unit (TNC 2003).

*Malacothamnus fasciculatus* var. *nesioticus* was first collected by E.L. Greene in 1886 at an unspecified location. Specimens were collected near Christy Ranch in 1927 by H. L. Mason and again in 1930 by R. Hoffmann (Christy Ranch site). Another locality on a steep, south-facing slope across the river bed from the University of California (UC) Field Station was discovered in 1993 by A. Wenner and S. Gliessman (Field Station site; also referred to by others as the Central Valley site). In May of 1997, Wilken collected specimens at this site and at a newly discovered site located on the ridge between the Horqueta and Alamos drainages (Horqueta-Alamos Ridge site) (D. Wilken, *in litt.* 2006a). Since the publication of the recovery plan in 2000, a fourth population was discovered in 1998 by J. Howarth (D. Wilken, *in litt.* 2006b) on the ridge between Cañada Cebada and Cañada de los Sauces (Cebada Ridge site).

### 2. Abundance, population and demographic trends:

Results from genetic studies indicate that each population of *Malacothamnus fasciculatus* var. *nesioticus* on Santa Cruz Island is made up of clones from a few individuals (McEachern and Chess 2006). This occurs because new shoots sprout from underground rhizomes, so that many stems actually represent the genotype of one plant, i.e. one genetic clone. For example, at the time the recovery plan was published in 2000, the Field Station population (also referred to as the Central Valley population) appeared to comprise 19 individual plants, but it was found to consist of clones of only 3 plants. Likewise, the Christy Ranch population consisted of less than 50 stems that represented only 10 plants. This research shows how improbable it would be to attain the recovery objective of securing several populations containing a minimum of 2,000 plants each to downlist the species.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*Malacothamnus fasiculatus* var. *nesioticus*
(Santa Cruz Island bush malllow)
USGS identified sites on
Santa Cruz Island, California
Site Status
- filled symbols indicate monitored sites
- numbers in symbols indicate site names; see Table X
historic, surveyed 2000 - 2005, not relocated
historic, surveyed 2000 - 2005, relocated
outplanting
USGS
science for a changing world
USGS
USGS/BRD-WERC
Channel Islands Field Station
NAD 27, UTM Zone 11, m. K. Niessen, 14 March 2006.

Figure 8

All four known populations of *Malacothamnus fasciculatus* var. *nesioticus* were surveyed during the 2004 and 2005 growing seasons by the USGS-BRD (McEachern and Chess 2006). Results of demographic surveys in 2004 are as follows (modified from McEachern and Chess 2006):

| **Site Name** | **2004 # of plants (separate genotypes)** | **2004 # of stems** |
|---|---|---|
| Field Station | ~3 | 19 (+ 3 dead stems) |
| Christy Ranch | 10 | 20-40 |
| Cebada Ridge | 7 | 1-314 (+ 19 dead stems) |
| *Horqueta-Alamos Ridge | 0 | 0 |

* None of the original 3 plants (50-60 stems) (Service 2000) were found at the Horqueta-Alamos Ridge site, even after searching three different times, during each of the 2004 and 2005 growing seasons (McEachern and Chess 2006). It was later realized that inconsistencies of details and a transcription error had made the site elusive. When the site was revisited in June 2006, well over 100 individual stems were located by the surveyors (D. Wilken, *in litt.* 2006b).

The three plants at the Horqueta-Alamos Ridge site appear much healthier and more robust than plants at the other localities (K. Chess, *in litt.* 2006). Chess reports the middle plant resembled a dense thicket of at least 42 stems, many of which were approximately 2 meters (6 feet) tall. Chess speculated on the reasons for the robustness of these plants. One possibility is that because the Horqueta-Alamos Ridge is very steep and hard to access, the site has been visited less often than the other sites. Consequently there may have been less compaction of the soil around the plants and less disturbance to the plants themselves from collecting stems for cuttings and samples. Another possibility is that because the vegetation at the site consists of grassland with scattered native shrubs, rather than the more dense vegetation at the other sites, there is less competition from other plants. Chess recommends that more research be focused on the community level because the species is surviving at localities that differ so much from each other in steepness, slope aspect, and plant community type.

**3. Research on seed characteristics:**

Voucher specimens of *Malacothamnus fasciculatus* var. *nesioticus* were collected at the Christy Ranch and Cebada Ridge sites during 2004 surveys. Because of low seed production, no fruit or seed was collected from wild populations in 2004 or 2005 (McEachern and Chess 2006).

Data collected by Wilken (D. Wilken, *in litt.* 2006b) suggest that seed production varies with site and year. For example, the Cañada Cebada population showed relatively high seed set in 2001, 2002, and 2003, whereas the Christy Ranch population has rarely produced seeds in any year that Wilken visited it. The population in the Central Valley by the UC Field Station has always produced seeds

but the number varies from year to year. Because strains derived from each of these populations growing at the Santa Barbara Botanic Garden (SBBG) have always produced seeds under controlled conditions (i.e., hand pollination), Wilken assumes that natural populations are pollen-limited by low insect visitation rates. He concludes that *Malacothamnus fasciculatus* var. *nesioticus* is clearly self-compatible and dependent on insect visitation for maximum fruit and seed set. Under controlled conditions at SBBG, Wilken has routinely seen 6-8 seeds per fruit (8-10 ovules per flower) following manipulated (hand) pollination, with more than 80 percent of all pollinated flowers setting fruit. Controls (not manipulated) show much lower fruit set, and anywhere from 2-6 seeds per flower. Fully formed seeds show high viability of at least 90 percent.

**4. Outplanting trials:**

Since 1996, a total of 24 plants have been transplanted into 6 fenced exclosures at Puertazuelo, Cascada, European Field, Stanton Airstrip, Valley Anchorage, and Alberts Ridge (D. Wilken, *in litt.* 2006a). Plants were grown at SBBG from cuttings from the natural Christy and Field Station populations. Four 1-gallon plants (two of each strain) were planted at each of the six enclosures except Alberts Ridge, at which six plants were planted. Only one of these plants survived and is located between Valley Anchorage and the Main Ranch airstrip (McEachern and Chess 2006). This plant has been doing very well in the exclosure, putting up at least a dozen stems a year since 2004. In early 2006, the USGS-BRD (McEachern and Chess 2006) reported seeing several new stems from this plant emerging outside the exclosure.

In December 2005, 51 plants were out-planted into four of the exclosures: Puertazuelo, European Field, Albert's Ridge, and Valley Anchorage. These plants were grown from cuttings taken from wild populations at three sites: Cebada Ridge, Horqueta-Alamos Ridge, and the Field Station site (D. Wilken, *in litt.* 2006a). The results are shown below (modified from McEachern and Chess 2006):

| **Site Name** | **Number planted in 2005** | **Alive as of March 2006** |
|---|---|---|
| European Field | 13 | 13 |
| Albert's Ridge | 13 | 13 |
| Puertazuelo | 13 | 13 |
| Valley Anchorage | 12 | 12 |
| *Field Station | Unknown | 1 |

* This site was planted by an unknown party and was not monitored by the USGS.

**5. Other conservation measures undertaken:**

In 2003, the USGS-BRD began a research program on Santa Cruz Island to aid in developing conservation plans. The program includes field surveys and monitoring to determine population status, field and greenhouse experiments to identify techniques

for propagation, and out-planting trials. In 2005, the USGS-BRD continued surveys for population locations not found in 2003-2004, completed annual demographic monitoring, collected seed for banking at the SBBG, and began research on breeding system, seed viability and out-planting in collaboration with Wilken at the SBBG.

In addition, NPS, in collaboration with the USGS-BRD and the Service, has developed a Conservation Strategy to help guide landscape level actions that would indirectly aid in recovery of *Malacothamnus fasciculatus* var. *nesioticus* and other threatened and endangered species on the northern Channel Islands (Coonan et al. 1996).

### II.C.2. Five-Factor Analysis (threats, conservation measures, and regulatory mechanisms

#### II.C.2.a. Present or threatened destruction, modification or curtailment of its habitat or range:

At the time of listing, *Malacothamnus fasciculatus* var. *nesioticus* was threatened by soil loss, habitat alteration, and feral pig rooting. Historically, large-scale habitat alteration caused by large numbers of nonnative mammals on the islands resulted in significant loss of soils, as well as changes in the structure, composition, and richness of plant communities (Service 2000). By the time the recovery plan was published in 2000, sheep had been removed from all the Northern Channel Islands. TNC and NPS initated a feral pig removal effort in 2005; as of September 2006, nearly all the pigs have been removed from the wild (C. Cory, TNC, pers. comm., 2006). The threat to the species from feral pigs is largely eliminated, although the residual effects of habitat alteration remain (see also sections II.C.2.c and II.C.2.e, below).

#### II.C.2.b. Overutilization for commercial, recreational, scientific, or educational purposes:

At the time of listing, this was not known to be a factor threatening *Malacothamnus fasciculatus* var. *nesioticus*. However, USGS-BRD data and observations since then point to the possibility that over-collecting in the past could have adversely affected the reproductive robustness of the plants, particularly at the Christy Ranch site (K. Chess, *in litt.* 2006). For many decades, the only known population of *M. f.* var. *nesioticus* was near the buildings at Christy Ranch and was visited frequently by researchers. Records from the 1920s and 1930s indicate that cuttings and samples were taken exclusively from these plants and this may have caused major drawback and low-seed set. To this day, the Christy Ranch population has very low seed production and has not produced any seeds in the last several years. In addition, the possibility of low insect visitation, as suggested by Wilken (*in litt.*, 2006a), may be another factor contributing to the Christy Ranch population's low seed production.

### II.C.2.c. Disease or predation:

At the time of listing, predation resulting from sheep grazing was considered a major threat to *Malacothamnus fasciculatus* var. *nesioticus* on Santa Cruz Island. Between 1983 and 1986, TNC removed over 30,000 sheep from the portion of the island within their ownership; by 1999, NPS had removed the remaining 2,000 sheep from the eastern end of the island (Schoenherr et al. 1999). Grazing is no longer considered a major threat to *M. f.* var. *nesioticus*.

### II.C.2.d. Inadequacy of existing regulatory mechanisms:

Because the NPS is involved with management of all populations of *Malacothamnus fasciculatus* var. *nesioticus*, all Federal laws and NPS policies and regulations apply to this species. The inadequacy of regulatory mechanisms was not considered a concern at the time of listing, and is not currently a concern.

The National Park Service Organic Act became law on August 25, 1916 (39 Stat. 535, 16 U.S.C. 1) and has been amended twice. The NPS Organic Act, as amended, states that the NPS "shall promote and regulate the use of the Federal areas known as national parks, monuments, and reservations … to conserve the scenery and the national and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations." The NPS Management Policies (NPS 2006a) indicate that NPS will "meet its obligations under the NPS Organic Act and the Endangered Species Act to both pro-actively conserve listed species and prevent detrimental effects on these species." This includes working with the Service and undertaking active management programs to inventory, monitor, restore and maintain listed species habitats, among other actions. The NPS prohibits collection of wildlife except under permit.

### II.C.2.e. Other natural or manmade factors affecting its continued existence:

*Malacothamnus fasciculatus* var. *nesioticus* is threatened by the risk of stochastic extinction due to small population size and limited distribution, which was a threat at the time of listing and continues to be a threat. The conservation biology literature commonly notes the vulnerability of taxa known from one or very few locations and/or from small populations (e.g., Shaffer 1981, 1987; Primack 1998); Groom et al. 2006). In particular, small population size makes it difficult for this species to persist while sustaining the impacts of soil loss, shrub canopy loss, and competition with annual plants.

The disruption of native habitats and displacement of native species by alien plants, particularly sweet fennel (*Foeniculum vulgare*) and nonnative grasses, was

considered a major threat at the time of listing (62 FR 40954). Fennel is particularly invasive because its leaves and stems contain chemicals that inhibit the growth of native plants (Schoenherr et al. 1999). Ironically, nonnative grazers seemed to control the spread of fennel by keeping a check on its abundance. Consequently, once the sheep had been removed, a program to manually remove sweet fennel was initiated for fear that it would take over vast areas of the island (Schoenherr et al 1999).

Since listing, NPS and TNC have identified nonnative feral pigs and sweet fennel as the most significant disturbances to native plant communities, rare plant species, and archaeological sites on Santa Cruz Island (Schoenherr et al. 1999; NPS 2006b). Pig rooting causes massive destruction of native species. Feral pigs typically travel in groups; areas appear as if rototilled, with large areas of bare earth remaining. With subsequent rains, the disturbed topsoil is carried away and patches remain bare for years (Schoenherr et al. 1999). These bare patches of ground are easily colonized by invasive weeds, especially fennel. Consequently, in October 2005, the NPS and TNC began a feral pig eradication program. Although the pig eradication was not expected to be completed until June 2007, as of September 2006, feral pigs are believed to be nearly gone from the island (C. Cory, pers. comm. 2006). More than 4,800 pigs have been eliminated since hunting began (NPS 2006b). The NPS and TNC intend to expand the fennel control program on Santa Cruz Island once it is certain that all the pigs have been eradicated (NPS 2006b). Active monitoring via helicopter will continue until it is determined the island is free of pigs (NPS 2006b).

## I.D. Synthesis

At the time of listing, three populations of *Malacothamnus fasciculatus* var. *nesioticus* were known; currently there are four known populations. Since 2003, the USGS-BRD and NPS have developed and implemented a research and monitoring program on Santa Cruz Island that includes field survey and monitoring of *M. f.* var. *nesioticus* to determine population status, field and greenhouse experiments to identify techniques for propagation, and out-planting trials on Santa Cruz Island (McEachern and Chess 2006). Research will continue through 2007 with current funding from the Santa Cruz Island pig eradication program and NPS Natural Resource Preservation Program. The pig eradication program is nearing completion and has alleviated much of the threat due to predation and trampling. Despite these efforts, the status of the species remains endangered due the low numbers of individuals, low numbers of populations, and low reproductive success in the field.

## III. RESULTS

### A. Recommended Classification:

**____ Yes, downlist to Threatened**
**____ Yes, uplist to Endangered**
**____ Yes, delist**
**__X_ No, no change is needed**

### B. New Recovery Priority Number: No change.

## IV. RECOMMENDATIONS FOR FUTURE ACTIONS

1. Seek additional funding beyond 2007 to continue field surveys and monitoring, demographic monitoring, population viability analyses, and further investigations into recovery prescriptions.

2. Expand the fennel eradication program as soon as feral pigs have been eliminated from Santa Cruz Island.

3. Implement exotic vegetation removal, such as nonnative grasses, from Santa Cruz Island.

4. Refine the generalized downlisting criteria to take into consideration new information regarding the limited number of genotypes that currently exist. Attaining the recovery objective of securing several populations containing a minimum of 2,000 plants each is unrealistic for this species.

5. Refine delisting criteria to emphasize long-term population trends rather than short-term gains or declines.

6. Investigate the community-level factors that influence population abundance, distribution, and demographic trends (e.g., slope steepness and aspect, vegetation type, etc.).

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Wilken, D. August 31, 2006b. Electronic mail sent to Della Snyder, USFWS, Vice President for Programs and Collections, Santa Barbara Botanic Garden, Santa Barbara, California.

Personal Communications

Cory, C. September 28, 2006. Telephone correspondence with Della Snyder, USFWS, concerning pig eradication program and Santa Cruz Island management. Ecoregional Ecologist, The Nature Conservancy, Ventura, California.

**U.S. FISH AND WILDLIFE SERVICE**
**5-YEAR REVIEW**
**Santa Cruz Island bushmallow (*Malacothamnus fasciculatus* var. *nesioticus*)**

**Current Classification:** endangered

**Recommendation resulting from the 5-Year Review:**

**____ Downlist to Threatened**
**____ Uplist to Endangered**
**____ Delist**
**_X__ No change is needed**

Appropriate Listing/Reclassification Priority Number, if applicable N/A

Review Conducted By: Della Snyder-Velto, Biologist

FIELD OFFICE APPROVAL:

Field Supervisor, Fish and Wildlife Service

Approve Diane K Noda Date 9/21/07

REGIONAL OFFICE APPROVAL:

Acting
Regional Director, Fish and Wildlife Service

Approve [signature] Date 9/25/07