Malacothrix indecora
(Santa Cruz Island malacothrix)
and
Malacothrix squalida
(island malacothrix)

5-Year Review:
Summary and Evaluation

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

August 2010

5-YEAR REVIEW

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I. GENERAL INFORMATION

Purpose of 5-Year Reviews:

The U.S. Fish and Wildlife Service (Service) is required by section 4(c)(2) of the Endangered Species Act (Act) to conduct a status review of each listed species at least once every 5 years. The purpose of a 5-year review is to evaluate whether or not the species' status has changed since it was listed (or since the most recent 5-year review). Based on the 5-year review, we recommend whether the species should be removed from the list of endangered and threatened species, be changed in status from endangered to threatened, or be changed in status from threatened to endangered. Our original listing of a species as endangered or threatened is based on the existence of threats attributable to one or more of the five threat factors described in section 4(a)(1) of the Act, and we must consider these same five factors in any subsequent consideration of reclassification or delisting of a species. In the 5-year review, we consider the best available scientific and commercial data on the species, and focus on new information available since the species was listed or last reviewed. If we recommend a change in listing status based on the results of the 5-year review, we must propose to do so through a separate rule-making process defined in the Act that includes public review and comment.

Species Overview:

As summarized in the recovery plan for these species, Thirteen Plant Taxa from the Northern Channel Islands Recovery Plan (Service 2000), *Malacothrix indecora* (Santa Cruz Island malacothrix) is a small, mat-like annual herb, in the chicory or dandelion tribe of the aster family (Asteraceae). The stems of *M. indecora* range from approximately 2 to 10 centimeters (cm) (0.8 to 4 inches) tall, and consist of numerous fleshy leaves and yellow-green flowers with slightly red-colored specialized linear leaves (phyllaries). There are eight known populations of *Malacothrix indecora*, which occur on four of the northern Channel Islands: Anacapa, San Miguel, Santa Rosa, and Santa Cruz. This species generally occurs along the edge of vegetated habitat along the rocky coastal bluffs, often on rich midden soil at elevations of less than 20 meters (m) (66 feet (ft)) above sea level (Davis 1993, Service 2000). Threats to *M. indecora* include soil loss; competition with invasive plants such as *Carpobrotus edulis* (iceplant), *Malephora crocea* (coppery mesemb), and *Mesembryanthemum crystallinum* (common iceplant); trampling by hikers, elk, deer, and seabird activity; stochastic extinction due to limited distribution of the species; and susceptibility to wave and storm damage and sea level rise (Service 2000; A.K. McEachern, U.S. Geological Survey, *in litt*. 2010).

Malacothrix squalida (island malacothrix) is an annual herb in the aster family, ranging in size from 4 to 30 cm (1.6 to 12 inch) tall, with sharply lobed leaves and light yellow flowers clustered in hemispheric heads (Service 2000). This species was historically reported as having four known occurrences on two of the northern Channel Islands: Santa Cruz and Anacapa. One of the historically reported populations on Santa Cruz Island has not been seen since 1886 (CNDDB 2010b, McEachern, *in litt.* 2010). Furthermore, based on our definition of a plant population (any occurrences within 0.25 mile of one another), two of the occurrences on Anacapa Island in the California Natural Diversity Database (CNDDB) are close enough in proximity to be considered a single population; therefore, we consider there to be two known extant populations of this species. *Malacothrix squalida* generally occurs on rocky canyon flats or slopes in shallow soils among coastal scrub vegetation at elevations of less than 200 m (656 ft) above sea level (Davis 1993, Service 2000). Threats to this species include erosion, habitat alteration from historical intensive sheep grazing, seabird nesting on Anacapa Island, competition with non-native plant species, and stochastic extinction due to limited distribution (Service 2000, McEachern, *in litt*. 2010).

Methodology Used to Complete This Review:

This review was prepared by the Ventura Fish and Wildlife Office (VFWO), following guidance issued by Region 8 in March 2008. In preparing this review, we used information from the recovery plan, survey information from experts who have been monitoring various localities of these species (particularly staff at Channel Islands National Park and U.S. Geological Survey), and the CNDDB maintained by the California Department of Fish and Game. The recovery plan and personal communications with experts were our primary sources of information used to update the species' status and threats. This 5-year review contains updated information on the species' biology and threats, and an assessment of that information compared to that known at the time of listing or the last 5-year review. We focus on current threats to the species that are attributable to the Act's five listing factors. The review synthesizes all this information to evaluate the listing status of a species and provide an indication of its progress towards recovery. Finally, based on this synthesis and the threats identified in the five-factor analysis, we recommend a prioritized list of conservation actions to be completed or initiated within the next 5 years.

Contact Information:

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>
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Federal Register Notice Citation Announcing Initiation of This Review: A notice announcing initiation of the 5-year review for these species and the opening of a 60-day period to

receive information from the public was published in the Federal Register (FR) on May 21, 2010 (75 FR 28636). No information was received in response to this request.

Listing History:

Original Listing
FR Notice: 62 FR 40954
Date of Final Listing Rule: July 31, 1997
Entity Listed: species (*Malacothrix indecora* and *Malacothrix squalida*)
Classification: Endangered

Associated Rulemakings: N/A

Review History: N/A

Species' Recovery Priority Number at Start of 5-Year Review: The recovery priority number for both *Malacothrix indecora* and *Malacothrix squalida* is 2, according to the Service's recovery plan for this species (Service 2000), based on a 1-18 ranking system where 1 is the highest-ranked recovery priority and 18 is the lowest (Endangered and Threatened Species Listing and Recovery Priority Guidelines, 48 FR 43098, September 21, 1983). This number indicates that each taxon is a species that faces a high degree of threat and has a high potential for recovery.

Recovery Plan or Outline

Name of Plan or Outline: Thirteen Plant Taxa from the Northern Channel Islands Recovery Plan

Date Issued: September 26, 2000

II. REVIEW ANALYSIS

Application of the 1996 Distinct Population Segment (DPS) Policy

The Act defines species as including any subspecies of fish or wildlife, or plants, and any distinct population segment (DPS) of any species of vertebrate wildlife. This definition limits listing as distinct population segments to vertebrate species of fish and wildlife. Because the species under review are plants and the DPS policy is not applicable, the application of the DPS policy to the listing of these species is not addressed further in this review.

Updated Information on Current Species Status, Biology, and Habitat

Species Biology and Life History
Both *Malacothrix indecora* and *Malacothrix squalida* are annual herbs in the aster or sunflower family (Asteraceae), which are native to California and endemic to the northern Channel Islands (Service 2000; California Native Plant Society (CNPS) 2010a,b). In North America, there are 21

different species within the *Malacothrix* genus (Davis 1993), four of which grow on the northern Channel Islands. *Malacothrix indecora* grows low to the ground with stems that are 2 to 10 cm (0.8 to 4 inches) tall, consisting of numerous fleshy leaves and yellow-green flowers with slightly red colored specialized linear leaves (phyllaries). The petals range from 1 to 4 mm (0.04 to 0.16 inches) with small hemispheric flower heads that are less than 10 millimeters (mm) (0.4 inches) across. *Malacothrix indecora* can be easily distinguished from the other four *Malacothrix* that occur on the same islands because it has smaller flowers and lacks teeth or bristles on the seed (Davis 1998, Junak et al. 1995). *Malacothrix indecora* is moderately self-compatible (Davis 1998) and this species hybridizes with several other *Malacothrix* species, including *M. squalida* (McEachern, *in litt.* 2010).

Malacothrix squalida ranges from 4 to 30 cm (1.6 to 12 inches) tall, with oblanceolate (rounded apex with a tapering base) basal leaves with narrow sharp lobes and upper leaves that are wider toward their bases with sharp lobes. The leaves range from 4 to 14 cm (1.6 to 12 inches) in length. *Malacothrix squalida* has light yellow flowers that are clustered in hemispheric heads which are 9 to 12 mm (0.4 to 0.5 inches) long with 20 to 26 phyllaries. The seeds are generally without bristles and the tips of the five strongest ribs are extended, which differentiates this species from other *Malacothrix* that occur on the same islands (Junak et al. 1995, Davis 1998). This species is self-pollinating and self-compatible (Davis 1998).

Taxonomy

Malacothrix indecora was first described by Edward Lee Greene (1886), based on specimens collected from "islets close to the northern shore of Santa Cruz Island." In 1957, Williams published a combination of the species as *Malacothrix foliosa* var. *indecora* (Ferris 1960) and subsequently Munz (1974) later synonymized the taxon with *Malacothrix foliosa*. However, Ferris (1960) and others (Smith 1976, Davis 1980) continued to recognize the taxon as *Malacothrix indecora* and this nomenclature has been retained in the most recent treatments of the genus (Davis 1993, Jepson 2010, Flora of North America (FNA) 2010a). There have been no changes in the taxonomic classification or nomenclature since the time of listing.

Malacothrix squalida was first described by Edward Lee Greene (1886), based on specimens which were collected from an islet of the northern shore of Santa Cruz Island. This species was reclassified as *Malacothrix foliosa* ssp. *squalida* in 1957 by E.W. Williams, but was subsequently published as *Malacothrix insularis* ssp. *squalida* in 1960 by Ferris (Ferris 1960). In 1959, Munz recognized the species as *M. squalida*, but later combined it with *M. foliosa* in 1974 (Munz 1974). The taxon was again reclassified as *M. squalida* by Davis in 1980 (Davis 1980) and this classification has been retained in the most current treatments of this genus (Davis 1993, Jepson 2010, FNA 2010b). There have been no changes in the taxonomic classification or nomenclature since the time of listing.

Historic and Current Distribution

At the time of listing, there were only two known extant populations of *Malacothrix indecora*; however, this species is now known from eight populations. After the first specimens of *M. indecora* were collected on northern Santa Cruz Island at Twin Harbor in 1886 (CNDDB EO 2), two populations were discovered in 1932 on San Miguel Island (including Cuyler Harbor on the eastern portion of Prince Island (CNDDB Element Occurrence (EO) 3) and between Hoffmann's

Point and Glass Float Beach (CNDDB EO 4)) (McEachern, *in litt*. 2010). Additionally, the species was discovered on Santa Cruz Island at Black Point in 1980 (CNDDB EO 1), near Potato Harbor in 2006 (CNDDB EO 6), and on Santa Rosa Island in the mouth of Lobo Canyon in 1996 (CNDDB EO 5) (McEachern, *in litt*. 2010). Two more populations were recently discovered this year on East Anacapa Island, near the area known as Inspiration Point (S. Chaney, National Park Service, *in litt*. 2010), along with one more unconfirmed location containing one individual discovered in May 2010 (N. Hale, Botanist, *in litt*. 2010). There are no historical records of *M. indecora* on Anacapa Island and the three recently discovered locations of this species on this island were all found where iceplant was removed in 2009 (Chaney, *in litt*. 2010).

Historically, there were three known populations of *Malacothrix squalida*; however, at the time of listing it was uncertain how many extant populations remained due to lack of recent survey data (Service 1997). There are currently two known extant populations of *Malacothrix squalida*. Recent survey data has confirmed the presence of one population of *Malacothrix squalida* (CNDDB EO 3), discovered in 1968, between Coche Point and Potato Harbor on Santa Cruz Island; however, the type locality population near Prisoners Harbor on Santa Cruz Island (CNDDB EO 1) has not been observed since 1886, despite several attempts to relocate this population. Additionally, there are two occurrences of *M. squalida* on Middle Anacapa Island: near the East Fish Camp area (CNDDB EO 2, discovered in 1931, and CNDDB EO 4, first reported in 1986); however, because they occur within 0.25 mile (0.4 km) of one another, we consider these to comprise a single population.

In summary, there has been no significant change in the geographic range for *Malacothrix squalida* since listing in 1997; however, several of the known populations appear to have expanded in areal extent in the last few years. *Malacothrix indecora* appears to be expanding its range, as it was not historically known on Anacapa Island, but was recently discovered in the spring of 2010 on East Anacapa Island.

Land Ownership and Management

Two populations of *Malacothrix indecora* (CNDDB EO 1 and 2) occur within the 76 percent of Santa Cruz Island that is owned by The Nature Conservancy. This portion of the island is generally closed to the public. Access to this portion of Santa Cruz Island is granted only for research and other special uses through a permit system. One population of *M. indecora* (CNDDB EO 6) and one population of *M. squalida* (CNDDB EO 1) occur within the remaining 24 percent of Santa Cruz Island, which is owned and managed by the National Park Service and is open to limited use by the public. One population of *M. squalida* (CNDDB EO 2 and 4) and two populations of *M. indecora* occur on Anacapa Island, which is also owned and managed by the National Park Service. Anacapa Island (which is comprised of a cluster of 3 islands) is open to very limited public access, including 2 miles of trails on East Anacapa Island and the beach at Frenchy's Cove on West Anacapa Island. Middle Anacapa Island, where the population of *M. squalida* occurs, is not open to the public. The two recently discovered populations of *M. indecora* occur on East Anacapa Island, which is open to limited access. Additionally, there was an unconfirmed third location with one individual of *M. indecora* discovered recently on East Anacapa, just southeast of Inspiration Point. Two populations of *M. indecora* (CNDDB EO 3 and 4) occur on San Miguel Island, which is under the jurisdiction of the U.S. Department the Navy, but under operational jurisdiction of the National Park Service through a memorandum of

agreement (MOA). Public access to San Miguel Island is limited to a campground and a beach access near Cuyler Harbor, in addition to occasional ranger-led tours. One population of *M. indecora* (CNDDB EO 5) occurs on Santa Rosa Island, which is owned and managed by the National Park Service and is open to limited use by the public (Service 2000; Chaney, *in litt.* 2010; CNDDB 2010a,b; Hale, *in litt*. 2010; McEachern, *in litt*. 2010).

Abundance and Population Trends

We have limited recent population count data (after 2002) for either species of *Malacothrix* (see Table 1 below). From the survey data that has been recorded, the number of individuals of *M. indecora* has ranged from approximately 10, 000 to almost 40,000 individuals over the last 30 years. Due to the lack of recent data, we cannot be sure whether the number of individuals of *M. indecora* has been increasing or decreasing over the last few years. The number of individuals of *M. squalida* has remained at under 50, based on the available survey information for this species. Because there is very little recent survey data or historical survey data that contains a record of the number of individuals, we cannot draw any conclusions about population trends for this species.

Table 1: Occurrence Records for *Malacothrix indecora* extracted from McEachern, *in litt*. 2010, and CNDDB 2010a, b.

Santa Cruz Island

CNDDB Identification Number or Index Number (CHIS)	**Coordinate Number or Location Description**	**Year Surveyed**	**Population Size**	**Site Owner**
CNDDB EO 1, including CHIS-227, 10050, and 10051	Black Point, W end of Santa Cruz Island	1980 (Junak) 1985 (Junak) 2000 (Cowan/McEachern) 2003 (Cowan)	101 to 1,000 1,000 0 0	TNC
CNDDB EO 2, including CHIS-230, 8851, and 228	Twin Harbors	1886 (Greene) 1939 (Williams) 2006 (Chess et al.)	-- -- 40 (CHIS-8851)	TNC
CNDDB EO 6, including CHIS-8897	Above mouth of N draining canyon ending at Potato Harbor	2006 (Chaney et al.)	18	NPS

San Miguel Island

CNDDB Identification Number or Index Number (CHIS)	**Coordinate Number or Location Description**	**Year Surveyed**	**Population Size**	**Site Owner**
CNDDB EO 3, including CHIS-1472 and 5312	Directly S of Eastern portion of Prince Island, near Cuyler Harbor, East San Miguel Island	1932 (Hoffmann) 1995 (Junak) 1998 (Chess et al.) 1999 (Chess) 2002 (Chess)	-- -- 4,574 1,626 5,351	NPS
CNDDB EO 4, including CHIS-1472, 3741, 1475, 1476, and 5314	Between Hoffmann's Point and Glass Float Beach, E San Miguel Island	1932 (Hoffmann) Junak (1995) 1998 (Chess et al.) 1999 (Chess) 2002 (Chess)	-- -- 9,448 12,767 to 18,767 9,771	NPS

Santa Rosa Island

CNDDB Identification Number or Index Number (CHIS)	Coordinate Number or Location Description	Year Surveyed	Population Size	Site Owner
CNDDB EO 5, including CHIS-5520, 569, 1469, 3739,	About 0.3 mi W of the mouth of Cow Canyon E to the mouth of Cañada Lobos, N Santa Rosa Island	1996 (Wilken et al.) 1998 (Chess) 1999 (Chess) 2000 (Chess) 2003 to 2007 (McEachern)	675 13,194 >3,750 1,000 to 4,000 ~7,000	NPS

Anacapa Island

CNDDB Identification Number or Index Number (CHIS)	Coordinate Number or Location Description	Year Surveyed	Population Size	Site Owner
New occurrence 1	Northwestern-most point of East Anacapa Island (Lower Inspiration Point)	2010 (Chaney)	~45 to 150	NPS
New occurrence 2	Central area of East Anacapa Island, close to south side of steps in trail descending from bench at midden area to Lower Inspiration Point area	2010 (Chaney)	~10 to 80	NPS
New occurrence 3 (not yet confirmed as of publication date of this review)	In the northwestern portion of East Anacapa Island, just southeast of Inspiration Point	2010 (Celis/Hale)	1	NPS

CNDDB Identification Number = occurrence number assigned by the California Natural Diversity Database (CNDDB 2010a,b)
TNC = The Nature Conservancy
NPS = National Park Service
CHIS = index number for NPS/USGS survey plots on the northern Channel Islands

Table 2: Occurrence Records for *Malacothrix squalida* extracted from McEachern, *in litt*. 2010 and CNDDB 2010a,b.

Santa Cruz Island

CNDDB Identification Number or Index Number (CHIS)	Coordinate Number or Location Description	Year Surveyed	Population Size	Site Owner
CNDDB EO 1	N side of island near Prisoners Harbor S of pier adjacent to lookout cabin	1886 (Greene)	--	NPS
CNDDB EO 3	E-facing slope of canyon running between "Coche Point" triangulation Point and Potato Harbor	1968 (Philbrick) 2006 (Chaney et al.)	-- 23	NPS

Anacapa Island

CNDDB Identification Number or Index Number (CHIS)	Coordinate Number or Location Description	Year Surveyed	Population Size	Site Owner
CNDDB EO 2 and EO 4, including CHIS-1478, 236, and 232	Middle of the island; Knife Edge area (near triangulation point) to W of East Fish Camp	1931 (Abrams/Wiggins) 1963 (Piehl) 1978 (Philbrick) 1986 (Junak) 1990 (Junak)	-- -- -- 20 (CHIS-232) 15 (CHIS-1478)	NPS

CNDDB Identification Number = occurrence number assigned by the California Natural Diversity Database (CNDDB 2010a,b)
TNC = The Nature Conservancy
NPS = National Park Service
CHIS = index number for NPS/USGS survey plots on the northern Channel Islands

Habitat or Ecosystem Conditions

In general, *Malacothrix indecora* occurs along the edge of coastal bluffs amongst chaparral, coastal scrub, *Eriogonum grande* ssp. *rubescens* (red buckwheat), *Carpobrotus* spp., and *Mesembryanthemum crystallinum*; in midden soil at elevations ranging from 5 to 60 m (16.4 to 196.9 ft). The Santa Cruz Island populations occur in soils derived from igneous and metamorphic rock along coastal dunes, bluffs, and exposed flats. On San Miguel Island, *M. indecora* is restricted to soils derived from igneous rock, whereas the population on Santa Rosa Island is associated with sedimentary coastal bluffs (Davis 1998, CNDDB 2010a, McEachern, *in litt*. 2010). *Malacothrix squalida* occurs on exposed rocky coastal bluffs and near the opening of canyon slopes, amongst coastal scrub, chaparral, and cismontane woodland, in elevations ranging from 15 to 30 m (49 to 98 ft) (CNDDB 2010b, McEachern, *in litt.* 2010).

Genetics

No new studies concerning the genetics of these taxa have been conducted since the time of listing.

Five-Factor Analysis

FACTOR A: Present or Threatened Destruction, Modification, or Curtailment of Habitat or Range

When *Malacothrix indecora* and *M. squalida* were listed in 1997, we discussed that these species were threatened by ongoing soil loss, trampling by non-native mammals and humans, erosion, seabird activity, and habitat alteration. The introduction of non-native sheep (*Ovis aries*) and pigs (*Sus scrofa*) in the early 1800's contributed to a significant increase in the rate of soil loss. Soil loss is considered a substantial threat to both species because it precludes seedling establishment and recruitment. The introduction of ranching to these islands in the 19th century spurred the introduction of many non-native mammals such as pigs, cows (*Bos taurus*), sheep, deer (*Odocoileus hemionus*), bison (*Bison bison*), goats (*Capra hircus*), and elk (*Cervus canadensis roosevelti*); which facilitated the spread of non-native, invasive plant species and led to high levels of erosion, soil compaction, sedimentation, and habitat type conversion. During the periods where many of these islands were heavily overstocked with non-native herbivores, many patches of barren land developed in the areas of highest use. The establishment of non-

native grass species, which have relatively weak root systems compared to most of the native vegetation, and the creation of barren patches of land further increased the levels of erosion that were already occurring. Furthermore, the overall health of the soil (i.e., nutrient cycling, water retention capability, and soil fertility) was compromised by the introduction of the non-native mammals due to the resulting soil compaction and loss of leaf litter, plant cover, and cyanobacterial lichen crusts. The introduction of non-native mammals to the island also led to increased levels of dust, which covers the foliage of the local plants, thus reducing the levels of photosynthesis, respiration, and transpiration that can occur (Service 1997, 2000).

Sheep and cattle were removed from the western portion of Santa Cruz Island in 1986 and pigs were completely removed from Santa Rosa Island in 1993, prior to the Federal listing of the species in 1997. Since listing, sheep have been completely removed from all the northern Channel Islands (Service 2000) and non-native pigs and turkeys (*Meleagris gallopavo*) were also completely removed from the Santa Cruz Island in 2006 (McEachern et al. 2009). Although some soil loss and erosion continues to occur, the removal of sheep and cattle from the northern Channel Islands and pigs from both Santa Cruz and Santa Rosa Islands, has helped to greatly reduce the rate of soil erosion. Privately owned deer and elk still remain on Santa Rosa Island, which are allowed under a 5-year renewable special use permit until the year 2011 (Service 2000). Continuing restoration efforts, such as those mentioned above, will alleviate some of the direct impacts to rare plants (Klinger et al. 1994) and will benefit both *Malacothrix* species over the long-term. However, until the overall health of the soil has been rejuvenated, soil loss will likely continue at higher than normal rates due to the fact that the poor quality of the soil resulting from years of damage precludes the establishment of native seedlings in most locations (Clark et al. 1990, Halvorson 1993).

Because all of the northern Channel Islands are owned and/or managed by two conservation-oriented entities (The Nature Conservancy (TNC) and the National Park Service (NPS)), neither *Malacothrix indecora* or *M. squalida* face any threats from development at this time and none are expected in the near future. Likewise, there is limited, if any, public access allowed at most of the locations where these species occur.

In summary, the types of threats affecting both *Malacothrix indecora* and *M. squalida* and their associated habitat remain similar to what they were at the time of listing. However, the intensity of these threats may have decreased since listing because of the many beneficial conservation management steps, such as the removal of most of the non-native mammals, which have been implemented over the last few years.

FACTOR B: Overutilization for Commercial, Recreational, Scientific, or Educational Purposes

In the listing rule for the species, we discussed that both *Malacothrix indecora* and *M. squalida* were potentially threatened by unrestricted collection for scientific or horticultural purposes, due to the fact that each species had populations of less than 100 individuals and any such loss would greatly affect these species (Service 1997). We do not have specific reports of unauthorized collection of either *Malacothrix* species and we believe that the relative inaccessibility of many

of the populations to the general public helps to decrease the threat of collection and/or removal; therefore, Factor B is not considered a significant threat to this species at this time.

FACTOR C: Disease or Predation

Disease was not considered a threat to the species at the time of listing (Service 1997), and is not necessarily considered a threat at this time. The listing rule for the species mentioned that all 13 of the listed island plant species covered in the final listing rule, with the exception of *Berberis pinnata* ssp. *insularis* (island barberry), were threatened by herbivory from non-native mammals and rooting damage from pigs. Because pigs have been removed from the northern Channel Islands, this is no longer considered to be a threat to these species. Additionally, many of the non-native mammals have since been removed from the northern Channel Islands, so the threat of herbivory has been greatly decreased; however, deer and elk have not yet been removed from Santa Rosa Island. Complete removal of both deer and elk from Santa Rosa Island is scheduled to take place by 2011 (Service 2000).

FACTOR D: Inadequacy of Existing Regulatory Mechanisms

At the time of listing, regulatory mechanisms thought to have some potential to protect both *Malacothrix indecora* and *M. squalida* included: (1) state laws and regulations, and (2) Federal land use laws and policies. The listing rule (62 FR 40954) provides an analysis of the level of protection that was anticipated from those regulatory mechanisms. This analysis appears to remain valid.

(1) State laws and regulations:

California Environmental Quality Act: Both *Malacothrix indecora* and *M. squalida* are ranked as 1B.1 by CNPS, indicating that both of these species are rare, threatened, or endangered in California and elsewhere and meet the criteria for state listing. Although neither species is State listed, project proponents would need to consider these species when conducting a biological evaluation for a potential project on private lands for purposes of the California Environmental Quality Act. *Malacothrix indecora* occurs on the portion of Santa Cruz Island that is managed and owned by TNC, which is a non-profit conservation organization that was established to help preserve the plants, animals, and natural communities that represent the diversity of life on Earth by protecting the lands and waters they need to survive (TNC 2010). Because the intent of this organization is to actively manage Santa Cruz Island for the conservation of threatened and endangered species, it is unlikely that State regulatory mechanisms would be invoked because development projects are unlikely to be proposed.

California Department of Fish and Game (CDFG): The CDFG generally regulates the management of pigs, deer, and elk herds through the issuance of hunting permits on private and public lands. The Nature Conservancy and CDFG established an MOA regarding the eradication of pigs on Santa Cruz Island, which has now been accomplished and has contributed to the cessation of pig-related ground disturbance. However, the deer and elk herds on Santa Rosa Island are considered private herds and therefore not regulated by CDFG.

(2) Federal Land Use Policies and Regulations

The National Park Service (NPS): Both *Malacothrix* species occur on islands owned and/or managed by NPS. The mission of the NPS is to preserve the unimpaired natural and cultural resources and values of the national park system for the enjoyment, education, and inspiration of this and future generations. The management of natural resources on park land is guided by Natural Resource Management Reference Manual #77 (NPS 2004). This agency is actively managing the northern Channel Islands for the conservation of threatened and endangered species, including invasive species removal and intermittent rare plant monitoring. The NPS signed a settlement agreement with the Environmental Defense Center in 1998 to remove all non-native ungulates from Santa Rosa Island by 2011 (Environmental Defense Center 1998). This settlement agreement was negated by Congressional provision in the past (as part of the 2007 Defense Authorization bill (H.R. 5122)) and subsequently reinstated as part of the Consolidated Appropriations Act of 2008 (H.R. 2764).

U.S. Navy: *Malacothrix indecora* occurs on San Miguel Island, which is under the jurisdiction of the U.S. Navy, but is managed in part by the NPS through an MOA that was renewed in 2008 (Department of the Navy 2008). The MOA states that the ''paramount use of the islands and their environs shall be for the purpose of a missile test range, and all activities conducted by or in behalf of the Department of the Interior on such islands, shall recognize the priority of such use'' (Department of the Navy 1963). The listing rule states that there had been no major conflicts concerning the conservation of natural resources on San Miguel Island (Service 1997) and we are not aware of any conflicts that have occurred since that time.

Federal Endangered Species Act (Act): With regard to federally listed plant species, section 7(a)(2) of the Act requires Federal agencies to consult with the Service to ensure any project they fund, authorize, or carry out does not jeopardize a listed plant species. Section 9 of the Act and Federal regulations pursuant to section 4(d) of the Act prohibit the "take" of federally endangered wildlife; however, the take prohibition does not apply to plants. Instead, plants are protected from harm in two particular circumstances. Section 9 prohibits (1) the removal and reduction to possession (i.e., collection) of endangered plants from lands under Federal jurisdiction, and (2) the removal, cutting, digging, damage, or destruction of endangered plants on any other area in knowing violation of a State law or regulation or in the course of any violation of a State criminal trespass law. Federally listed plants may be incidentally protected if they co-occur with federally listed wildlife species. However, because there have been few, if any, proposed Federal projects that would potentially impact these species, the limited protections afforded to these species have not been called into play.

In summary, the entire distribution occurs on lands that are generally managed for conservation, either by a conservation-oriented non-governmental organization (TNC), or by a Federal agency that manages their lands through conservation-oriented mandates and directives (NPS). We have not completed any formal consultations for these species other than to issue a recovery permit (pursuant to section 10(a)(1)(A) of the Act) to NPS for collection of voucher specimens. We believe that this factor is less of a concern than it was at the time of listing; however, current land use management policies and certain state regulatory mechanisms provide only discretionary protections for these species based on current management direction, but do not guarantee

protection for the species absent its status under the Act. Therefore, we continue to believe other laws and policies have limited ability to protect these species in the absence of the Act.

FACTOR E: Other Natural or Manmade Factors Affecting Its Continued Existence

Fire and Invasive Species

At the time of listing, we discussed general threats to both *Malacothrix indecora* and *M. squalida*, including the effects of habitat type conversion from native grass and herb species to non-native, invasive plant species (Service 1997). In the listing rule, we noted that there were over 180 non-native plant species in the northern Channel Islands alone. Competition from non-native plants is a threat to rare native taxa, such as *M. indecora and M. squalida*, because these species tend to take over available habitat and compete for the same limited resources (Klinger et al., in prep.).

Non-native plant species, including grasses and herbs, have been present on the northern Channel Islands for over 150 years (Service 1997; Klinger et al., in prep; McEachern et al. 2009). Some of the non-native plant species that compete directly with *Malacothrix indecora* and *M. squalida* include *Carpobrotus edulis, Malephora crocea, Mesembryanthemum crystallinum* and non-native grasses. The recent increase in overall cover of non-native herbaceous species on Santa Cruz Island was likely an indirect result of the eradication of sheep from there in the 1980's (Klinger et al., in prep.). Non-native species often exist in high proportions on islands (Loope and Mueller-Dombois 1989). Within the Channel Islands, the proportion of non-native species ranges from approximately 20 to 48 percent of the total number of species that occur on each island (Junak et al. 1995); the biological invasions caused by these non-native species are often considered one of the greatest threats to overall biodiversity (Loope and Mueller-Dombois 1989, Mooney and Drake 1989, Wilcove et al. 1998). The introduction and spread of non-native species is occurring at unprecedented levels (Di Castri 1989, Service 1997, Ricciardi 2007), leading to the alteration of species composition, extirpation of native species, and modification of community structure and function (D'Antonio and Vitousek 1992). Specifically, an invasion of non-native plants can lead to the alteration of the fire regime (D'Antonio and Vitousek 1992), hydrological processes (Bell 1997), and nutrient cycles (Vitousek 1990) of an ecosystem. Studies indicate that non-native plant species often compete with native species for light (Brown and Rice 2000) and water (Eliason and Allen 1997). Additionally, excessive buildup of organic matter may locally increase soil moisture and reduce light levels (Berendse 1999).

The eradication of non-native mammals from Santa Cruz Island has generally been considered a success in terms of achieving many of the overall long-term conservation goals for the island (Klinger et al. 1994). When sheep and cattle were present on the island, there was likely adequate grazing pressure to keep some of the non-native grasses and *Foeniculum vulgare* (fennel) at lower levels of density and abundance; however, when the 5-year drought period ended in 1991 and there were no longer sheep and cattle present to graze on the island, the relative cover and abundance of many of these non-native species increased rapidly (Klinger et al. 1994). Ultimately, this explosion of non-natives has led to a decrease in diversity of native plant species throughout the grassland ecosystems over much of Santa Cruz Island (Klinger et al. 1994, Service 1997).

As discussed in the Channel Islands National Park Wildland Fire Management Plan (NPS 2006), the Channel Islands have a relatively unique fire regime compared to the mainland. Although many of the plant species and habitat types on Santa Cruz Island are similar to those on the mainland, including some of the more fire-prone ecosystems such as grasslands and chaparral, the fire frequency and magnitude on the island are relatively low. This lowered fire risk is mostly due to a lack of ignition sources and the often cool and foggy climate that is associated with the northern Channel Islands. Likewise, fire magnitude and frequency may have been reduced over the last 200 years because of the decrease in fuel loading and vegetation cover due to the high-intensity grazing that occurred on the islands until recently. The policy of the NPS, for the portion of the northern Channel Islands they own, is to suppress all wildfires that occur on the island in the interest of protecting natural habitat, people, and property (NPS 2006).

In summary, we still believe that non-native plant species and catastrophic fires pose a risk to both the *Malacothrix* species. With the removal of non-native herbivores, we have also seen an increase in vegetation biomass, thus increasing the chance of larger and more frequent fires. Particularly, the vegetative biomass of non-native species has increased, due to the removal of non-native herbivores and continued exposure, thus increasing the amount of competition for resources for both *Malacothrix* species. There has been some speculation that climate change may further complicate these two issues; however we lack adequate information to draw any conclusions about the specific changes that may occur on the northern Channel Islands as a result of climate change (please see discussion under Climate Change below).

Hybridization

Malacothrix indecora and M. squalida hybridize both with one another and with several other *Malacothrix* species (McEachern, *in litt*. 2010). In particular, there is one documented occurrence of *M. indecora and M. squalida* hybrids in a north-draining canyon at Potato Harbor on Santa Cruz Island (McEachern, *in litt*. 2010). There are two other *Malacothrix* species that occur on the same islands as *M. indecora*, but *M. indecora* is the only other *Malacothrix* species that co-occurs with *M. squalida* (Junak et al. 1995). Hybridization was not addressed in the listing rule or the recovery plan and we lack any specific data which would allow us to draw any conclusions about how hybridization may affect either of these species at this time.

Stochastic Extinction

At the time of listing, we noted that due to the limited geographic range, and limited number of individuals and populations of both *Malacothrix indecora* and *M. squalida*, these species were at risk of stochastic extinction resulting from loss of genetic diversity, through chance events affecting survival and reproduction, and through naturally occurring catastrophic events, such as fire, drought, disease, or storms (Service 1997). We believe that the existence of only two and eight relatively isolated populations of *M. squalida* and *M. indecora*, respectively, place these species at risk of extinction from stochastic events. Because both species have a relatively limited geographic range and exist as only a few populations, the genetic viability and resilience of both *M. indecora* and *M. squalida* to human-caused or natural disasters may be greatly reduced (Menges 1991, Ellstrand and Elam 1993). Studies on Santa Cruz Island have shown that unexpected, complex interactions sometimes result in substantial declines within endemic species populations that were assumed to be stable (Roemer et al. 2001). The conservation biology literature commonly notes the vulnerability of taxa known from one or very few

locations and/or from small and highly variable populations (Shaffer 1981, Groom et al. 2006, Primack 2006). In particular, although the plants are apparently self-compatible, the small size of the populations make it difficult for these species to persist while sustaining the impacts of soil damage (compaction and erosion) and habitat alteration that favors non-native species.

Climate Change

Current climate change predictions for terrestrial areas in the northern hemisphere indicate warmer air temperatures, more intense precipitation events, and increased summer continental drying (Field et al. 1999, Cayan et al. 2005, Intergovernmental Panel on Climate Change (IPCC) 2007). Recently, the potential impacts of climate change on the flora of California were discussed by Loarie et al. (2008). Based on modeling, they predicted that species' distributions will shift in response to climate change and that the species will "move" to higher elevations and northward, depending on the ability of each species to do so. In the case of smaller island ecosystems, such as those that exist on the northern Channel Islands, the opportunities to move to higher elevations or further north are limited. We lack adequate information to make specific and accurate predictions regarding how climate change, in combination with other factors such as limited geographical distribution, will affect federally listed species; however, small-ranged species such as *Malacothrix indecora* and *M. squalida* are more vulnerable to extinction due to these changing conditions (Loarie et al. 2008).

In conjunction with climate change, an increase in the rate of sea level rise has been predicted for the coast of California (California Coastal Commission 2001, California Climate Change Center 2006). In particular, ocean bluffs along the coast will likely be subject to greater and more frequent wave attack, resulting in erosion and shoreline retreat (California Coastal Commission 2001). Jeff Severinghaus, a professor of geosciences at the Scripps Institute of Oceanography in San Diego, recently estimated that for every foot (0.3 m) that the sea level rises in California, approximately 100 ft (30.5 m) of shoreline might be lost (Scolari 2009). The IPCC (2007) estimates that the sea level will rise between 7 and 22 inches (between 0.2 and 0.6 m) by the end of this century.

Because all of the populations for both *Malacothrix* species occur on coastal bluffs in close proximity to the ocean, these species are subject to a wide range of climatic conditions, such as occasional salt spray (Wilken 1996), which may directly affect the soils and plants at low elevation exposed coastal flats. Sea level rise and the continued erosion of the ocean-front cliffs on the exposed bluffs of the northern Channel Islands from high surf and storm events, in addition to climate variability, both from year to year and due to large-scale climate change, pose a threat to the relatively small and exposed *Malacothrix* populations.

In summary, the combination of threats associated with soil loss and habitat degradation (discussed in Factor A), limited range, and existence of only a few populations with limited numbers of individuals of both *Malacothrix indecora* and *M. squalida* make these species particularly vulnerable to substantial declines as a result of random human-caused or natural events.

III. RECOVERY CRITERIA

Recovery plans provide guidance to the Service, States, and other partners and interested parties on ways to minimize threats to listed species, and on criteria that may be used to determine when recovery goals are achieved. There are many paths to accomplishing the recovery of a species and recovery may be achieved without fully meeting all recovery plan criteria. For example, one or more criteria may have been exceeded while other criteria may not have been accomplished. In that instance, we may determine that, over all, the threats have been minimized sufficiently, and the species is robust enough, to downlist or delist the species. In other cases, new recovery approaches and/or opportunities unknown at the time the recovery plan was finalized may be more appropriate ways to achieve recovery. Likewise, new information may change the extent that criteria need to be met for recognizing recovery of the species. Overall, recovery is a dynamic process requiring adaptive management, and assessing a species' degree of recovery is likewise an adaptive process that may, or may not, fully follow the guidance provided in a recovery plan. We focus our evaluation of species status in this 5-year review on progress that has been made toward recovery since the species was listed (or since the most recent 5-year review) by eliminating or reducing the threats discussed in the five-factor analysis. In that context, progress towards fulfilling recovery criteria serves to indicate the extent to which threat factors have been reduced or eliminated.

In the recovery plan (Service 2000), general delisting criteria for the suite of 13 covered plants involve increasing the number of known 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. The plan suggests that until research demonstrates otherwise, downlisting for herbaceous species should target securing several populations containing a minimum of 2,000 plants each. The number of populations and the number of individuals will vary depending on the biology and life history of each taxon as well as the amount of suitable habitat available. The probability of population persistence over the long-term is expected to be higher for larger populations and taxa with a large number of populations because large size decreases the likelihood of reduced viability or population extirpations due to random naturally occurring events. The downlisting and delisting criteria for each of the two taxa are as follows:

Malacothrix indecora

The recovery plan indicates that downlisting for *Malacothrix indecora* can be considered when the following criterion has been achieved:

- Stable populations are maintained on San Miguel, Santa Cruz, and Santa Rosa Islands for a period of 15 years that includes the normal precipitation cycle.

This criterion is relevant; however, it should be updated to include a more measurable and threats-based component. Additionally, it may become increasingly difficult to evaluate the population over 15 years that includes the normal precipitation cycle due to the fact that the normal precipitation cycle is already changing and is predicted to continue to fluctuate considerably under the effects of climate change (IPCC 2007). This criterion does not include a clear definition of what constitutes a stable population for this species; therefore, it should be

updated to include a more concrete definition of this term. David Keith presents a widely accepted method of evaluation of at-risk plant species that is based on The World Conservation Union (IUCN) Red List Criteria of 1994, consisting of a set a decision rules based on quantitative thresholds of population size, distributional range, rates of decline, and extinction risk (Keith 1997). We recommend that the recovery criteria for *Malacothrix indecora* be updated to include a more well-defined method, such as the one presented by Keith (1997), for assessing when this species can be considered stable and recovered.

Despite the three new occurrences of *Malacothrix indecora* that were discovered this year, the most recent surveys of the *M. indecora* populations seem to show that overall, the number of individuals has decreased somewhat since listing (McEachern, *in litt*. 2010). Additionally, the precipitation cycles during the last 15 years have not been normal (Levine et al. 2009, Levine et al. 2010); therefore, this criterion has not been met.

The recovery plan indicates the delisting of *Malacothrix indecora* can be considered when the following criterion has been achieved:

- There has been no decline of the species for 10 years after downlisting.

This criterion is relevant; however it is rather vague. We recommend that this criterion be revised to take into consideration that there may be some fluctuation in the population sizes of these annual plant species; however, delisting may be considered when this species is considered recovered based on the quantitative methods of evaluation presented by Keith (1997) or some other comparable method. This criterion has not yet been met.

Malacothrix squalida

The recovery plan indicates that downlisting for *Malacothrix squalida* can be considered when the following criterion has been achieved:

- Ten additional populations have been discovered or outplanted on Anacapa and Santa Cruz Islands and stable populations have been maintained for a period of 15 years that includes the normal precipitation cycle.

This criterion is relevant; however, it should be updated to include a more measurable and threats-based component. Additionally, it may become increasingly difficult to evaluate the population over 15 years that includes the normal precipitation cycle due to the fact that the normal precipitation cycle is already changing and is predicted to continue to fluctuate considerably under the effects of climate change (IPCC 2007). This criterion does not include a clear definition of what constitutes a stable population for this species; therefore, it should be updated to include a more concrete definition of this term. David Keith presents a widely accepted method of evaluation of at-risk plant species that is based on The World Conservation Union (IUCN) Red List Criteria of 1994, consisting of a set a decision rules based on quantitative thresholds of population size, distributional range, rates of decline, and extinction risk (Keith 1997). We recommend that the recovery criteria for *Malacothrix squalida* be updated to include a more well-defined method, such as the one presented by Keith (1997), for assessing when this species can be considered stable and recovered.

The most recent surveys of the *Malacothrix squalida* populations seem to show that the number of individuals has decreased somewhat since listing, but the total number of individuals is already very low and we lack recent survey data needed to draw a more definitive conclusion (McEachern, *in litt*. 2010). Additionally, the precipitation cycles during the last 15 years have not been normal (Levine et al. 2009, Levine et al. 2010). Therefore, this criterion has not been met.

The recovery plan indicates the delisting of *Malacothrix squalida* can be considered when the following criterion has been achieved:

- There has been no decline of this species for 10 years after downlisting.

This criterion is relevant; however it is rather vague. We recommend that this criterion be revised to take into consideration that there may be some fluctuation in the population sizes of these annual plant species; however, delisting may be considered when this species is considered recovered based on the quantitative methods of evaluation presented by Keith (1997) or some other comparable method. This criterion has not yet been met.

IV. SYNTHESIS

The status of both *Malacothrix indecora* and *M. squalida* has not changed substantially since the time of listing in 1997. Currently, there are eight known populations of *M. indecora*, which occur on four of the northern Channel Islands: Anacapa, San Miguel, Santa Rosa, and Santa Cruz. These populations have exhibited some decline in the number of individuals over the last 15 years and we are lacking recent or comprehensive survey data for all of the populations, which makes it difficult to draw any conclusions about the current abundance trend for this species. There are three locations of *M. indecora* that were recently discovered in the spring of 2010 on East Anacapa Island where large patches of iceplant were removed in 2009. These new discoveries appear to indicate that this species might be expanding its range, since it was not historically known from Anacapa Island. There are two known extant populations of *M. squalida*, which occur on two of the northern Channel Islands: Santa Cruz and Anacapa. These populations have exhibited some decline and overall fluctuation in numbers of individuals over the last 15 years, but the number of individuals of this species is already very low and we do not have any recent or comprehensive survey data, which makes it difficult to draw any conclusions about the current abundance trend for this species.

The entirety of both *Malacothrix* species populations and suitable habitat occurs on the northern Channel Islands that are owned or managed by either TNC or NPS. As a result, development and direct anthropogenic pressures are not considered substantial threats at this time. The populations of *M. indecora* that occur on San Miguel Island, which is under the jurisdiction of the U.S. Navy, might be at a slightly higher risk for eventual loss of habitat due to potential future military development and/or activities; however, to date the U.S. Navy has been supportive of the preservation of this species on this island. Continued invasion of the suitable habitat for both *M. indecora* and *M. squalida* by non-native plant species would likely lead to further decline of these species. Likewise, due to the fact that there are only eight known populations of *M. indecora* and two known extant populations of *M. squalida*, these species

remain at risk of experiencing substantial declines as a result of stochastic events, especially given the possible changes that are predicted to occur as a direct result of climate change (i.e., sea level rise, etc.). Overall, these species remain threatened by extinction due to their existence in only several isolated populations; limited geographic range; and ongoing threats to these species, such as soil loss and degradation, competition from invasive plant species, and other stochastic events. Therefore, we believe that both *M. indecora* and *M. squalida* still meet the definition of endangered, and recommend no status change at this time.

V. RESULTS

Recommended Classification:

_____ Downlist to Threatened
_____ Uplist to Endangered
_____ Delist (*indicate reasons for delisting per 50 CFR 424.11*):
____ *Extinction*
____ *Recovery*
____ *Original data for classification in error*
__X__ No Change

New Recovery Priority Number and Brief Rationale: The recovery priority number for *Malacothrix indecora* should be changed to 8, which is the correct number for a species which faces a moderate degree of threat and has a high potential for recovery. Several of the threats to the survival of this species have been removed or ameliorated in the last few years and ongoing efforts, such as the removal of non-native plant and animal species are continuing. We believe that this species has a high potential for recovery due to the fact that it is exists on land that is managed for the conservation benefit of the species and will likely benefit from some of the ongoing conservation efforts that are being undertaken on the islands where this species occurs.

The recovery priority number should remain at 2 for *Malacothrix squalida*. The recovery priority of 2 is the correct number for a species that faces a high degree of threat and has a high potential for recovery. Due to the existence of this species in only two known populations and a low number of individuals overall, this species still faces a high degree of threat, even though several of the threats to this species have been removed since listing. However, we believe that this species has a high potential for recovery due to the fact that it is exists on land that is managed for the conservation benefit of the species and will likely benefit from some of the ongoing conservation efforts that are being undertaken on the islands where this species occurs.

VI. RECOMMENDATIONS FOR FUTURE ACTIONS

1. Develop and implement monitoring and adaptive management plans for all of the existing populations. Monitoring should occur at intervals of 1 to 2 years and include population abundance surveys, habitat condition assessment, and documentation of existing and potential threats.

    1a. Work closely with agencies such as TNC, USGS, and NPS to continue monitoring efforts for the species and to develop a long-term adaptive management plan for special status species which occur on the northern Channel Islands.

2. Develop and implement an integrated non-native plant control program for Santa Cruz, Anacapa, San Miguel, and Santa Rosa Islands, which complements and enhances existing efforts.

3. Continue to research the species' life history requirements, especially with regard to the habitat conditions favorable to both species.

    3a. Specifically, we recommend a follow-up study to evaluate the response of both *Malacothrix* species to the removal of the non-native mammals from Santa Cruz, Santa Rosa, and San Miguel Islands and whether recovery of the soil health and stability has occurred. Because non-native large herbivores still remain on Santa Rosa Island, some baseline data could be gathered now and compared with the results that are gathered several years after the eventual removal of the remainder of these animals.

4. Update the recovery criteria for both *Malacothrix indecora* and *M. squalida* to include a more measurable and threats-based evaluation method, based on the recommendations presented in the discussion of the recovery criteria for both species on pages 16 through 18 of this review.

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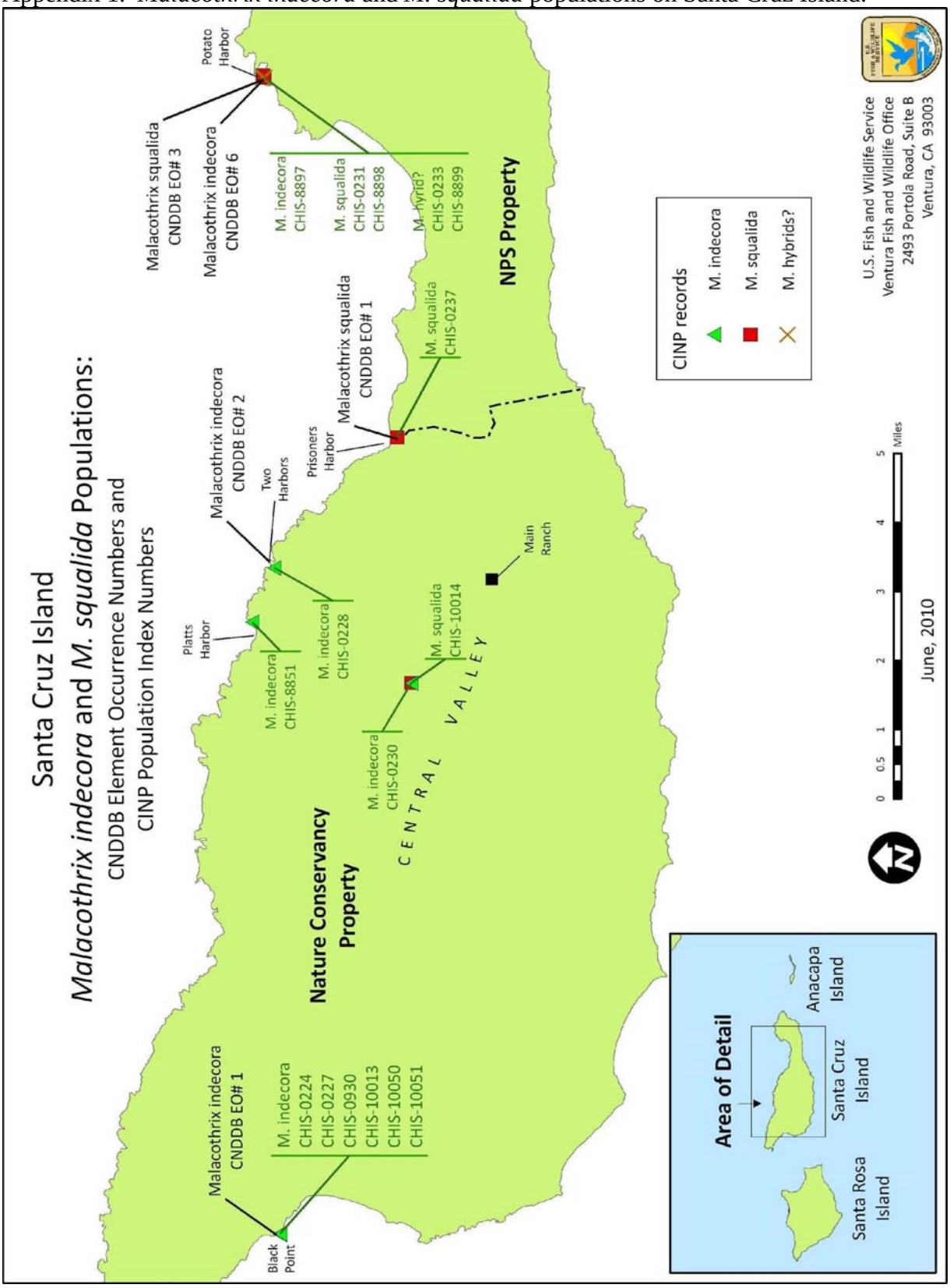
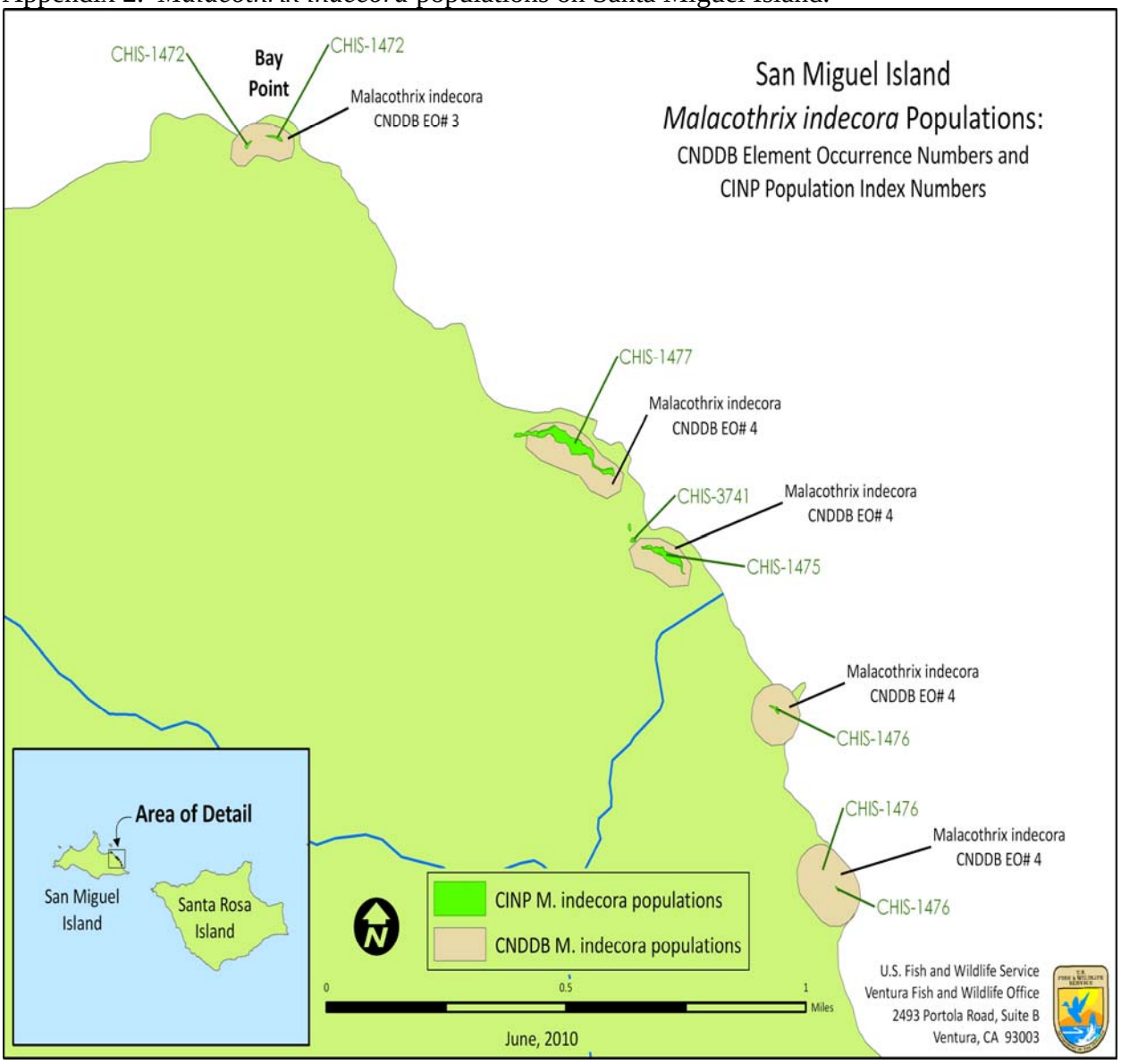
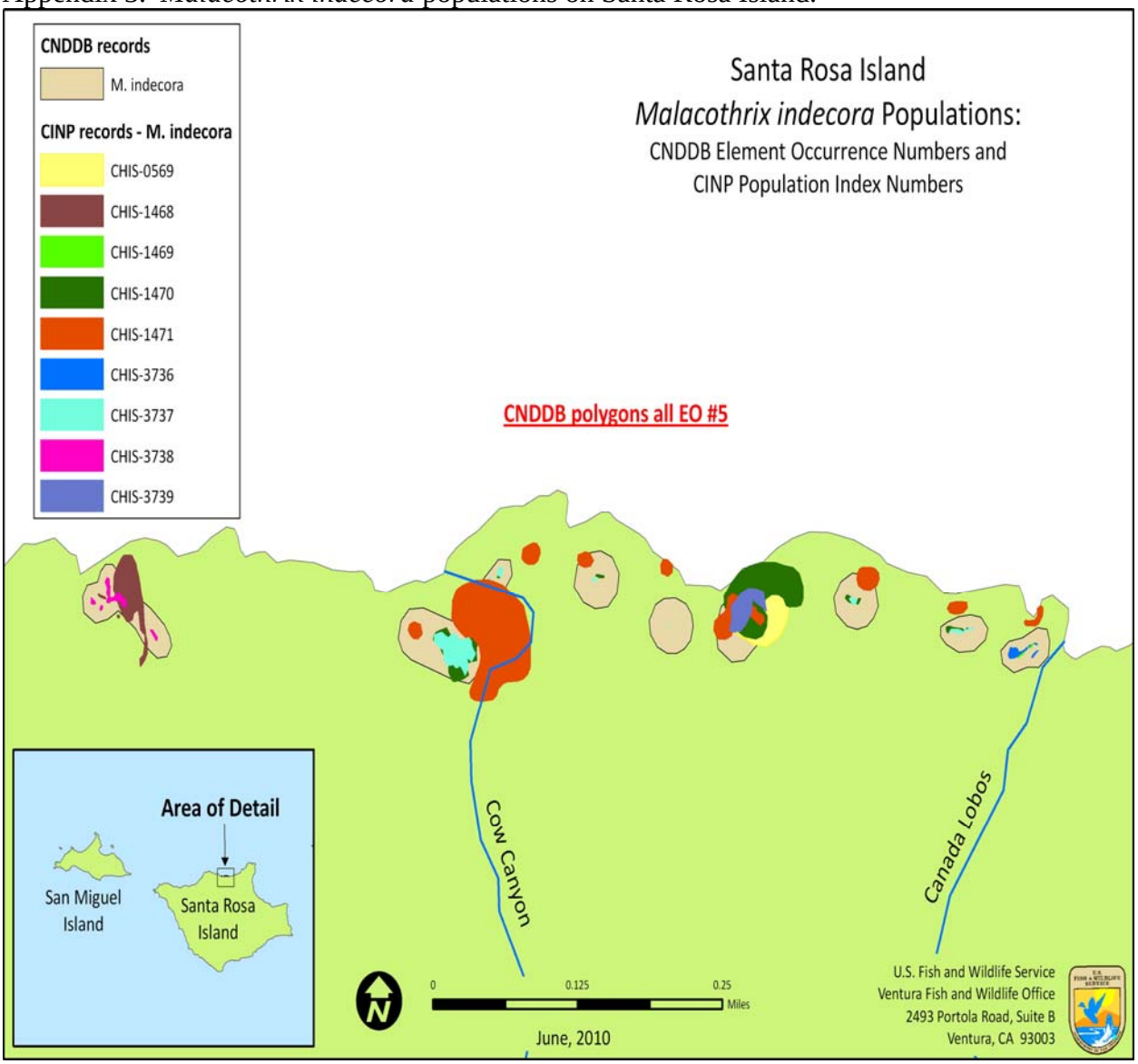
Appendix 1. *Malacothrix indecora* and *M. squalida* populations on Santa Cruz Island.



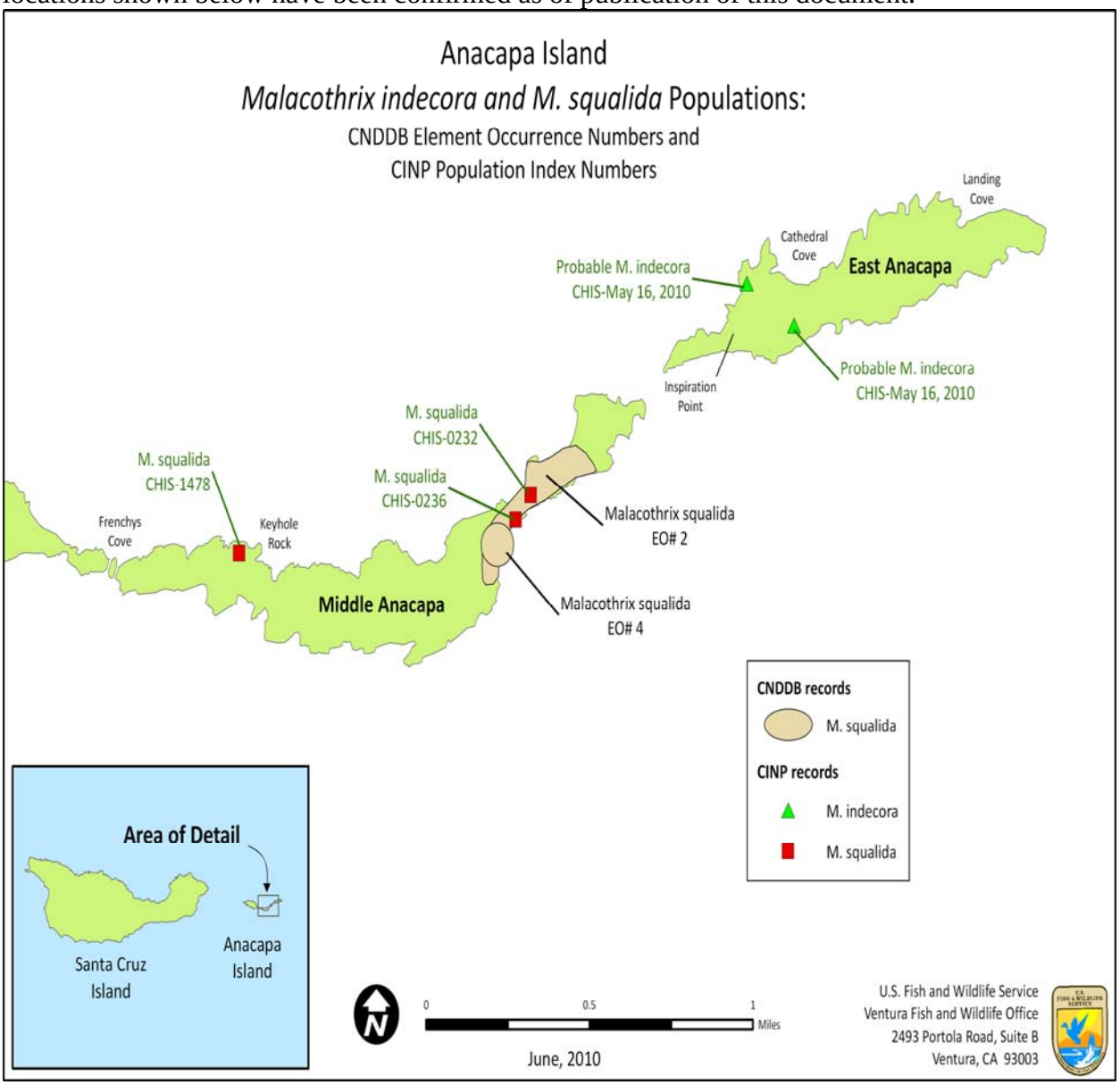
Appendix 2. *Malacothrix indecora* populations on Santa Miguel Island.



Appendix 3. *Malacothrix indecora* populations on Santa Rosa Island.



Appendix 4. *Malacothrix indecora and M. squalida* populations on Anacapa Island. "Probable" locations shown below have been confirmed as of publication of this document.



U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW

Malacothrix indecora
(Santa Cruz Island malacothrix)

Current Classification: Endangered

Recommendation Resulting from the 5-Year Review:

____ Downlist to Threatened
____ Uplist to Endangered
____ Delist
__X__ No change needed

Review Conducted By: Heather Abbey

FIELD OFFICE APPROVAL:

Field Supervisor, U.S. Fish and Wildlife Service

Approve Diane K Noda Date 8/30/10

U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW

Malacothrix squalida
(island malacothrix)

Current Classification: Endangered

Recommendation Resulting from the 5-Year Review:

____	Downlist to Threatened
____	Uplist to Endangered
____	Delist
_X_	No change needed

Review Conducted By: Heather Abbey

FIELD OFFICE APPROVAL:

Field Supervisor, U.S. Fish and Wildlife Service

Approve Diane L. Noda Date 8/30/10