

Helianthemum greenei
(island rush-rose)

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



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

June 2010

5-YEAR REVIEW

Helianthemum greenei (island rush-rose)

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:

Helianthemum greenei (island rush-rose) is a small shrub in the rock rose family (Cistaceae). The species has been reported from four of the Channel Islands off the coast of southern California: San Miguel, Santa Rosa, Santa Cruz, and Santa Catalina; however, the species is believed to be extirpated from San Miguel. Since listing, the number of occurrences on the islands has increased from 15 to 87. The species is found in open, exposed areas in chaparral, coastal sage scrub, cismontane woodland, and island pine forest (California Native Plant Society (CNPS) 2009). *Helianthemum greenei* is likely fire-dependent, as the number and size of occurrences increased dramatically soon after fire events, with little to no recruitment observed absent of fire (McEachern and Wilken 1996, Service 2000). *Helianthemum greenei* is threatened by the direct and indirect effects of historical and on-going grazing and other damage by non-native mule deer (*Odocoileus hemionus*), elk (*Cervus elaphus*), bison (*Bison bison*), sheep (*Ovis aries*), goats (*Capra aegagrus*), and pigs (*Sus scrofa*) (Hochberg et al. 1980; Chaney, Channel Islands National Park, pers. comm. 1999; S. Ratay, Catalina Island Conservancy, *in litt.* 2009).

Methodology Used to Complete This Review:

This review was prepared by the Ventura Fish and Wildlife Office, following the Service's Region 8 guidance issued in March 2008. We used information from the recovery plan (Service 2000), survey information from experts who have been monitoring various localities of this species, and the California Natural Diversity Database (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. We did not receive any information from the public in response to our notice in the Federal Register initiating this 5-year review. 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 and since 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 the 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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Cooperating Field Office(s): Gary Wallace, Botanist, Carlsbad Fish and Wildlife Office, (760) 431-9440, extension 207.

Federal Register Notice Citation Announcing Initiation of This Review: A notice announcing initiation of the 5-year review of this taxon and the opening of a 60-day period to receive information from the public was published in the Federal Register (FR) on March 25, 2009 (74 FR 12878). No information was received in relation to this species.

Listing History:

Original Listing

FR Notice: 62 FR 40954

Date of Final Listing Rule: July 31, 1997

Entity Listed: *Helianthemum greenei* (species)

Classification: Threatened

Review History: The recovery plan (Service 2000) evaluated the status of the species. However, no formal 5-year reviews have been conducted since the species' listing in 1997.

Species' Recovery Priority Number at Start of 5-Year Review:

The recovery priority number for *Helianthemum greenei* is 8 according to the Service's 2009 Recovery Data Call for the Ventura Fish and Wildlife Office, 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 the taxon is a species that faces moderate threats and has a high recovery potential.

Recovery Plan or Outline

Name of Plan: 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 of species under the Act limits listing as distinct population segments to species of vertebrate fish or wildlife. Because the species under review is a plant, the DPS policy is not applicable, and the application of the DPS policy to the species’ listing is not addressed further in this review.

Information on the Species and its Status

Species Biology and Life History

Helianthemum greenei is a small shrub in the rock rose family (Cistaceae). The plant grows to 18 inches (0.5 meter) tall and has alternate leaves covered with star-shaped hairs. The reddish, glandular-hairy stalks support yellow-petaled flowers, each 1 inch (2.5 centimeters) wide. The fruit is a pointed capsule 0.25 inch (0.6 centimeter) long. A more abundant species found on the Channel Islands, *Helianthemum scoparium* (peak rush-rose) is similar in appearance, but it is not glandular-hairy and has greenish stalks and smaller fruits (Hochberg et al. 1980; McClintock 1993).

The species is found in open, exposed areas in chaparral, coastal sage scrub, cismontane woodland, and island pine forest up to 1,608 feet (490 meters) in elevation (CNPS 2009). Individual plants produce 50 to 70 flowers per plant and every flower produces seed. When the flowers are insect pollinated, the plant produces a maximum of 12 seeds per fruit; seed production is reduced when the plants are self-pollinated (Service 2000). There is currently little information available on the dispersal mechanisms of island rush rose.

Until a series of wildfires on the Channel Islands during the 1990s, occurrences of *Helianthemum greenei* were reported to be widely-dispersed but consisted of only one to four plants each. *Helianthemum greenei* has been known to germinate in open space in the absence of fire; however, researchers have documented large increases in the number and size of occurrences after fires where occurrences were thought to be small or non-existent (McEachern and Wilken 1996; Knapp 2005; Ratay *in litt.* 2009) and no new germination several years after the fire event. This suggests that the species may not require fire for germination, but fire appears to increase germination efficiency. The mechanism responsible for this process is unclear; the species may be responding to either the physical effects (e.g., temperature extremes, chemical changes, etc.) of fire, or the open ground space created by fire.

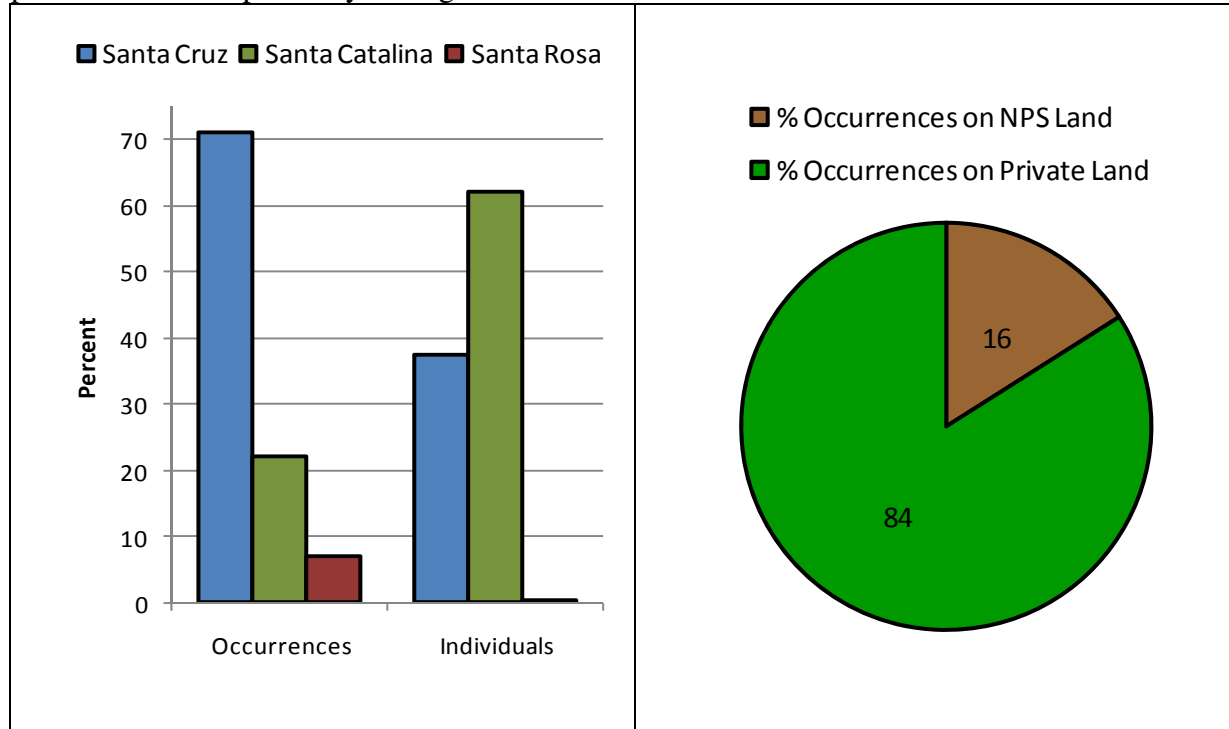
Spatial Distribution

At the time of listing, *Helianthemum greenei* had been reported from four of the Channel Islands off the coast of southern California: San Miguel (McMinn 1932; Thorne 1967), Santa Rosa (Wallace 1985), Santa Cruz (Hochberg et al. 1980; McEachern and Wilken 1996), and Santa Catalina (Thorne 1967; Takara, Catalina Island Conservancy, pers. comm. in Service 1994). The species was believed to be extirpated on Santa Rosa Island and San Miguel Island by the time of listing; the known historical occurrences could not be relocated. *Helianthemum greenei* was extant in at least 10 occurrences on Santa Cruz Island and at least 1 occurrence on Santa Catalina.

Helianthemum greenei is currently known to occur on Santa Cruz Island, Santa Catalina Island, and Santa Rosa Island; on the latter island, three occurrences were discovered in grazing exclosures between 1999 and 2006 (Chaney, pers. comm. 1999, McEachern *in litt.* 2009). The species has not been observed on San Miguel Island in over 40 years (Thorne 1967, Service 2000, McEachern and Rodriguez 2008), and we consider *H. greenei* extirpated from that island. Although we cannot discount the possibility that there may still be a viable soil seed bank on San Miguel Island, we do not expect the range of the species to increase unless reintroduction efforts are initiated.

Figure 1 illustrates the distribution of *Helianthemum greenei* occurrences and individuals by island and by private versus Federal land ownership. Of the 87 known or presumed extant occurrences (Chaney, pers. comm. 1999; Service 2000; McEachern et al. 2008; Ratay *in litt.* 2009; K. McEachern, U.S. Geological Survey, *in litt.* 2009), 16 percent are located on National Park Service (NPS) lands, and 84 percent are located on privately owned preserves that are managed primarily for the conservation of natural resources. Seven percent of occurrences are located on Santa Rosa Island, 71 percent are located on Santa Cruz Island, and 22 percent are located on Santa Catalina Island. Thirty-seven percent of known individuals are located on Santa Cruz, 62 percent are located on Santa Catalina, and less than 1 percent are located on Santa Rosa. Of the 22 occurrences visited by McEachern et. al. (2008) on Santa Cruz Island, 14 percent of occurrences were on National Park Service property, and 86 percent were on The Nature Conservancy (TNC) property. This proportionality roughly corresponds to the ownership of Santa Cruz Island (TNC owns approximately 75 percent of the island).

Figure 1. Approximate distributions of all known *Helianthemum greenei* and proportion of occurrences on land owned by the National Park Service (NPS), compared to privately owned preserves that are primarily managed for the conservation of natural resources.



Abundance

For the purposes of this document, we will consider an occurrence to be one or more groups of closely associated individuals (not including the soil seed bank) that are geographically isolated from other groups. This term and definition is purely descriptive and may not reflect biological relevance.

The number of occurrences of *Helianthemum greenei* across the species’ geographic range has increased from 15 known at the time of listing in 1997 to 87 by 2009 (McEachern et al. 2008, Ratay *in litt.* 2009, McEachern *in litt.* 2009). The total number of individuals has increased from perhaps a few hundred in 1980, to approximately 3,000 at the time of listing (Service 1997), to approximately 7,400 by 2009 (McEachern et al. 2008, Ratay *in litt.* 2009, McEachern *in litt.* 2009). While wildfires and removal of non-native ungulates are clearly linked to increases in numbers of individuals and occurrences, we recognize that the increase in known occurrences and recent recruitment could also be the result of a combination of the following factors: (1) some were extant but previously undetected; (2) some plants are the result of expression of an existing seed bank; and (3) some may represent plants derived from recent dispersal events.

Santa Cruz Island

In 1995, Junak et al. reported that *Helianthemum greenei* was occasional but widely scattered throughout Santa Cruz Island. At the time of listing, 14 occurrences of *H. greenei* were known from the island, and there are currently 62 occurrences totaling approximately 2,435 individuals (McEachern et al. 2008). While the number of occurrences on Santa Cruz Island has increased since the removal of cattle, sheep (cattle and sheep were removed from TNC property by 1986

and from NPS property by 1999), and pigs (by 2007) (McEachern et al. 2008), the number of individuals has been roughly stable or decreasing since listing in 1997. This apparent contradiction can likely be explained by a large increase in the size of occurrences after wildfires on Santa Cruz Island in 1994 (McEachern and Wilken 1996). More recently appearing occurrences are likely responding to the removal of predation pressure and germinating at a far lower efficiency than post-wildfire rates.

The increase in known occurrences should continue on Santa Cruz Island without intensive management as non-native ungulates are absent, and *Helianthemum greenei* was one of several native species found to have “vigorous individuals with good seed production, and a range of size classes within occurrences that indicates recent recruitment” (McEachern et al. 2008). Figure 2 displays the locations of known extant occurrences on Santa Cruz Island.

Santa Catalina Island

At the time of listing, only one extant occurrence of *Helianthemum greenei* was known from Santa Catalina Island, and the recovery plan documented five extant occurrences on Santa Catalina Island in 2000. Currently, there are 19 extant occurrences comprising approximately 5,000 individuals on the island (Ratay *in litt.* 2009). Although mule deer and bison remain on the island, the most recent data indicate that the number of *H. greenei* individuals on Santa Catalina has increased overall in response to fire events in 1999, 2003, and 2007, and pig removal in 2005. *Helianthemum greenei* sprouted in three places within the 1999 burn area at Goat Harbor and in 19 places within the 2007 burn area. The Catalina Island Conservancy fenced nearly all *H. greenei* occurrences after the 2007 fire to protect them from deer. The persistence of these and all unfenced occurrences on Santa Catalina Island is tenuous as bison often compromise the integrity of the fences, which provides deer access (Ratay *in litt.* 2009), and even relatively large occurrences that are left unfenced and vulnerable have disappeared within a year (Knapp 2005). Figure 3 displays the locations of known historical and extant occurrences on Santa Catalina Island.

Santa Rosa Island

At the time of listing, all *Helianthemum greenei* on Santa Rosa Island were thought to be extirpated. The species had last been observed on that island in the 1930s, and subsequent surveys have not been able to relocate the original occurrence (Clark et al. 1990; McEachern *in litt.* 2009). A lone occurrence was discovered within an enclosure to prevent grazing by deer and elk (pigs were removed by 1993) on the federally endangered *Arcotostaphylos confertiflora* (Santa Rosa Island manzanita) in 1999 (Chaney, pers. comm. 1999); however, this occurrence is no longer extant above ground. Seven additional occurrences were discovered scattered around the east (Sierra Pablo site) and north (Black Mountain site) sides of the island between 2000 and 2006, each consisting of only a few individuals (McEachern *in litt.* 2009). The two Black Mountain occurrences are presumed extant on the north side of the island. One of the occurrences at the Sierra Pablo site is no longer extant above ground. Careful surveys have not been conducted for the other four occurrences at Sierra Pablo in recent years; however, the site is visited regularly, and none of these occurrences have been observed since 2006 (McEachern *in litt.* 2009).

Some *Helianthemum greenei* germination is occurring outside grazing exclosures (McEachern *in litt.* 2009); however, these individuals are likely consumed by deer or elk prior to reproducing. Eventually this process may eliminate any soil seed bank that persists outside the exclosures. The proposed removal of non-native ungulates from Santa Rosa Island by 2011 may reverse this trend. Figure 4 displays the locations of known extant occurrences on Santa Rosa Island.

The probability of recovery on Santa Rosa Island improved with the discovery of new occurrences between 2000 and 2006. Even though the occurrences contain few individuals, evidence suggests that small occurrences of healthy, seed-producing plants may produce a persistent soil seed bank that, in the wake of a fire event, in absence of grazing animals, and with enough rain, can increase occurrence size by up to two orders of magnitude (McEachern and Wilken 1996; Ratay *in litt.* 2009). Therefore, the potential for the species to repopulate Santa Rosa Island is high, given the right conditions.

Table 1 summarizes known historical and current estimates of the total number of individuals on each of the four islands on which *Helianthemum greenei* has been reported. During the most recent surveys on Santa Cruz Island, not all occurrences were examined for the exact number of individuals; some were only described qualitatively. McEachern et al. (2008) collected data at 22 *H. greenei* occurrences, and they knew of up to 40 additional extant occurrences at which they were unable to collect data. For these 40, we extrapolated using averages of known occurrence size to arrive at an island-wide estimate. Where McEachern et al. (2008) gave a high and low estimate for the sum of individuals in a given occurrence, we used the lower of the two numbers and arrived at an estimate of 2,435 individuals. For the sake of comparison, using the higher of the two gives an island-wide estimate of 3,644 individuals. On Santa Rosa Island, four of the six possibly extant occurrences may no longer be extant above ground. Careful surveys have not been conducted to verify this; therefore, we included them in the island-wide estimate.

Table 1. Summary of historical and current estimates of *Helianthemum greenei* numbers.

Island	# of occurrences prior to listing	# of individuals prior to listing	Document	Year	# of extant occurrences	# of extant individuals
San Miguel	1	n/a	Listing	1997	0	0
			Recovery Plan	2000	0	0
			5yr	2009	0	0
Santa Rosa	2	n/a	Listing	1997	0	0
			Recovery Plan	2000	1	n/a
			5yr	2009	2-6	20
Santa Cruz	10	100	Listing	1997	14	3000
			Recovery Plan	2000	14	>2,700
			5yr	2009	22-62	2,435
Santa Catalina	1	n/a	Listing	1997	1	3
			Recovery Plan	2000	5	n/a
			5yr	2009	19	5,000

Habitat or Ecosystem

Helianthemum greenei is found in a variety of plant communities including chaparral, coniferous forest, oak woodland, coastal scrub, and grassy hillsides; however, the species is most often found in chaparral or mixed oak-pine woodland associated with *Quercus* spp. (island oak), *Lyonothamnus floribundus* (island ironwood), *Pinus* spp. (pine), *Ceanothus* spp. (California false lilac), *Arctostaphylos* spp. (manzanita), *Eriogonum* spp. (buckwheat), *Adenostoma fasciculatum* (chamise), *Salvia brandegei* (Santa Rosa Island sage), *Atriplex semibaccata* (Australian saltbush), *Amsinckia menziesii* (fiddleneck), *Calandrinia ciliata* (redmaids), *Selaginella bigelovii* (spike moss), *Avena barbata* (slender oat), *Bromus* spp. (bromes), *Hordeum murinum* (seaside barley), *Vulpia* spp. (fescue), and *Nasella pulchra* (purple needlegrass) (McClintock 1993; Junak et al. 1995; CNPS 2009). *Helianthemum greenei* can grow in a variety of dry, rocky substrates including fine-grained shales, rocky volcanic soils, and alluvial deposits in ephemeral stream channels (Junak 1995; Center for Plant Conservation 2009). The largest occurrences of *H. greenei* are found in open areas that have recently burned (McEachern and Wilken 1996; Ratay *in litt.* 2009).

The amount of habitat available for *Helianthemum greenei* is variable over time. In the absence of non-native ungulates, the species colonizes open spaces within suitable habitat. Fire frequency has dramatic influence over the abundance and distribution of the species; large occurrences will appear shortly after fire events and gradually decrease in size as other successional species colonize the area. Currently, it is unclear whether fire is required for large increases in abundance or whether the species is responding to the open space created by fire.

Five-Factor Analysis

At the time of listing, we identified the loss of topsoil and predation by non-native mammals as the primary threats to *Helianthemum greenei*. The following five-factor analysis describes and evaluates the threats attributable to one or more of the five listing factors outlined in section 4(a)(1) of the Act.

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

The listing rule (Service 1997) identified the large-scale loss of topsoil caused by non-native mammal activity as the primary cause for the decline of *Helianthemum greenei*. Non-native mammals initially consumed native plants, which tended to be replaced by non-native grasses. The shallow-rooted, non-native grasses were poorly suited to erosion control compared to the deep-rooted, native shrubs. The non-native mammals also trampled the soil crust. An intact crust hinders erosion and is critical in maintaining healthy soil functions such as nutrient cycling. With the topsoil unsecured, natural erosion processes (i.e., wind and rain) were exponentially accelerated. On exposed ridgetops, high winds prevent the accumulation of soil and preclude the reestablishment of native plants.

Santa Cruz Island

Just prior to the time of listing, topsoil loss and sedimentation on Santa Cruz Island was still occurring at a much higher rate than it did prior to non-native mammal introduction (Cole and

Liu 1994). By 2007, the last of the non-native mammals (sheep, pigs, cattle), and thereby the source of accelerated soil loss, was removed. A threat not identified at the time of listing has surfaced with the removal of non-native mammals from Santa Cruz Island. In the absence of grazing pressure, non-native plants (e.g., *Foeniculum vulgare* (fennel)) have swiftly expanded their range and may out-compete *Helianthemum greenei* for habitat. This process may occur on other islands should non-native mammals be removed from there also.

Santa Catalina Island

Although feral pigs have been removed from the island, soil loss is still a threat on Santa Catalina Island, as deer and bison continue to disturb the soil. The California Department of Fish and Game manages the deer population as a sub-unit of management zone D-15, which includes portions of Los Angeles, Orange, Riverside, San Bernardino, and San Diego counties (California Code of Regulations 2009). The deer population is estimated to range from 800 to 2,500 individuals, with the variation largely dependent on rainfall (Ratay *in litt.* 2009). The historical peak size of the Santa Catalina bison population, which is not managed by the California Department of Fish and Game, was between 250 and 600 individuals. To balance herd health and minimize impacts to native habitat, the Catalina Island Conservancy currently maintains the bison population at fewer than 200 individuals (Catalina Island Conservancy 2009).

Santa Rosa Island

Cattle and pigs were removed from Santa Rosa Island prior to listing and this has, in part, reduced the threat of soil loss. Deer and elk remain on Santa Rosa Island as part of a private hunting operation, and they impact *Helianthemum greenei* in a similar manner to the ungulates on Santa Catalina Island. Deer and elk are being gradually eliminated from Santa Rosa Island and are expected to be completely removed by 2011. In the meantime, the rarity of *H. greenei* on Santa Rosa Island makes the species' persistence far more tenuous relative to Santa Cruz and Santa Catalina, which have multiple occurrences. The loss of any topsoil and the associated seed bank may further reduce the chance of recovery on that island.

In summary, since listing, the threat from loss of topsoil has been substantially reduced on Santa Cruz Island due to the removal of non-native mammals; however, competition with non-native plants has become an additional threat to the species. On Santa Catalina Island, topsoil loss was in part alleviated with the removal of feral pigs; however, deer and bison remain. On Santa Rosa Island, topsoil loss was in part alleviated with the removal of cattle and pigs, and a reduction in the sizes of the deer and elk populations; however, the ongoing impacts to *H. greenei* on that island are largely unchanged.

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

Overutilization of *Helianthemum greenei* for any purpose was not known to be a factor in the 1997 final listing rule (Service 1997) and does not appear to be a threat at this time.

FACTOR C: Disease or Predation

Disease was not listed as a factor in the final listing rule (Service 1997) and does not appear to be a threat at this time.

Predation by one or more non-native mammals was identified as a factor in the final listing rule. Like nearly all other plant species in the listing rule, *Helianthemum greenei* was identified as susceptible to predation by non-native mammals because it lacks defensive adaptations to predation that many mainland plants possess (Bowen and van Vuren 1997). Non-native mammals consume soft growth and woody portions of the plant prior to reproduction, thereby reducing the number of adults and preventing replenishment of the soil seed bank.

At the time of listing, *Helianthemum greenei* on Santa Cruz Island was threatened by predation by sheep on NPS property on the eastern end of the island and by pigs island-wide. The species is no longer threatened by predation on Santa Cruz Island; the last non-native mammals were removed in 2007. On Santa Catalina Island, *H. greenei* is still threatened by consumption by deer. Bison are not considered predators of *H. greenei*, but they affect the habitat of the species through trampling (see Factor A). The Catalina Island Conservancy has erected fences to prevent deer access to nearly all new occurrences of *H. greenei*; however, bison are strong enough to break through the fences and thus provide deer with continued access to the enclosures (Ratay *in litt.* 2009).

The listing rule identified deer and elk as predators of *Helianthemum greenei* on Santa Rosa Island, and this analysis appears to remain currently valid. *Helianthemum greenei* is known to exist only inside or nearby ungulate enclosures erected to protect the federally endangered *Arctostaphylos confertiflora* (Santa Rosa Island manzanita). The species is germinating outside the enclosures; however, predation pressure likely destroys young plants before they can reproduce and replace the soil seed bank. As per a settlement agreement (see Factor D below), efforts to remove all deer and elk from Santa Rosa Island will be completed in 2011. This would relieve predation pressure on *H. greenei* on this island.

FACTOR D: Inadequacy of Existing Regulatory Mechanisms

At the time of listing, regulatory mechanisms thought to have some potential to protect *Helianthemum greenei* included: (1) the National Environmental Policy Act (NEPA), (2) the Federal Endangered Species Act (Act), (3) NPS guidelines for natural resources management (NPS 1991), and (4) the NPS Statement for Management (NPS 1985). The listing rule (Service 1997) provides an analysis of the level of protection that was anticipated from those regulatory mechanisms. The species does not have designated special status (e.g., endangered, threatened, or rare) from the State of California and receives no protection under the California Endangered Species Act or the California Native Plant Protection Act. The inadequacy of regulatory mechanisms was not considered a concern at the time of listing, and this analysis appears to remain valid.

Helianthemum greenei is afforded some protections by management practices of the Catalina Island Conservancy (Conservancy) (Ratay *in litt.* 2009). The Conservancy maps known

locations of three categories of plants: locally rare plants on the island, Catalina Island endemics, and listed species. Conservancy biologists are included in planning processes for activities that may impact such listed species and avoidance is usually possible. The listing status of the species has meant that conservation and protection measures factor in management decisions regarding placement of exclosures for deer. Ratay (*in litt.* 2009) considered that the species would likely be more adversely affected by habitat disturbance on Catalina Island if it were not federally listed.

The Act is the primary Federal law that provides protection for this species throughout its geographic range since its listing as threatened in 1997. The NPS management documents listed above provide discretionary protections for the species on Santa Rosa Island and the eastern quarter of Santa Cruz Island. NPS policies and regulations do not appear to guarantee protection for the species absent its status under the Act. For example, NPS protections on Santa Rosa Island are restricted by an agreement with the former landowner to continue grazing operations. The NPS signed a settlement agreement with the Environmental Defense Center (EDC 1998) to remove all non-native ungulates from Santa Rosa Island by 2011. 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).

The *Helianthemum greenei* occurrences on Santa Cruz Island are protected through a cooperative management agreement between TNC and NPS, to manage Santa Cruz Island as a single ecological unit (TNC 2003). The Nature Conservancy takes an ecosystem approach to managing Santa Cruz Island and may not manage specifically for federally listed species.

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

At the time of listing, we discussed non-native plants and their potential to disrupt native habitats and displace native species (Service 1997). The listing rule included *Helianthemum greenei* as one of the species most susceptible to lack of recruitment and habitat displacement by non-native plants. The removal of non-native ungulates released predation pressure on both native and non-native plants. Without management, non-native plants that have a competitive advantage would increasingly affect the distribution and recruitment of *H. greenei*. We believe the analysis in the listing rule remains valid.

At the time of listing, we also discussed the vulnerability inherent in small population size. Historically, *Helianthemum greenei* probably existed in relatively small groups of individuals, with occasional increases after fire or other vegetation clearing events. The diversity of habitats, elevations, and islands where the species can survive hedges susceptibility to most random events. Currently, large numbers of individuals on Santa Cruz and Santa Catalina Islands, and wide distribution of occurrences on Santa Cruz Island, make it unlikely that the species could be extirpated on these islands by anything but the most extreme stochastic event. Alternatively, the few occurrences on Santa Rosa Island could be extirpated by any number of circumstances, including low genetic diversity and demographic imbalance, and unforeseen events such as climatic phenomena.

Since the time of listing, we have recognized climate change as a potential new threat. Current climate change predictions for terrestrial areas in the Northern Hemisphere indicate warmer air temperatures, more intense precipitation events, increased summer continental drying, and increased fire frequency (Field et al. 1999; Cayan et al. 2005; Westerling et. al. 2006; Intergovernmental Panel on Climate Change 2007). Recently, Loarie et al. (2008) modeled the potential impacts of climate change on the flora of California. They predicted that species' distributions will shift in response to climate-driven habitat changes. Specifically, they predicted that, in general, species will shift northward and to higher elevations, and may experience a reduction in the extent of available habitat. Species will redistribute with shifting habitat, depending on the ability of each species to do so. Species diversity will also shift with a general trend of diversity increasing towards the coast and northwards, with these areas becoming de facto future refugia.

Predictions of climatic conditions for small sub-regions such as the California Channel Islands remain uncertain. Given the narrow geographic range of *Helianthemum greenei*, the species will have limited ability to disperse in response to climate change. *Helianthemum greenei* may be able to take advantage of significant altitudinal gradients on Santa Catalina Island, Santa Rosa Island, and Santa Cruz Island, and an increased frequency of wildfires may actually benefit the species. While we recognize that climate change is an important issue with potential effects to listed species and their habitats, we lack adequate information to make accurate predictions regarding its effects to particular species at this time.

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.

The recovery plan that includes *Helianthemum greenei* states that the recovery objective is to delist the species (Service 2000). The recovery plan suggests that until research shows otherwise, downlisting for subshrubs addressed in the plan (including *H. greenei*) should target securing several occurrences containing a minimum of 2,000 plants each. In addition, the plan

states that delisting generally involves meeting downlisting criteria, as well as finding, repatriating, or introducing additional occurrences of the species.

The delisting criterion specific to *Helianthemum greenei* listed in the recovery plan consists of maintaining existing stable occurrences on Santa Cruz Island and Santa Catalina Island for a period of 15 years that includes the normal precipitation cycle. We believe: (1) this criterion needs to be amended to include maintenance of existing occurrences on Santa Rosa Island, (2) given the uncertainty and threats involved in climate change, an effort should be made to quantify a “normal precipitation cycle” for the California Channel Islands, and (3) this criterion should be revised to include more recent guidance to develop threats based criteria for recovery plans.

The current delisting criterion has been partially met and addresses Listing Factors A, C, and E. Though some occurrences of the species on Santa Catalina and Santa Rosa Islands have been extirpated since 1999, many new occurrences have been detected. Progress has been made toward meeting this criterion through:

1. Location of many new occurrences of *Helianthemum greenei* on Santa Cruz, Santa Catalina, and Santa Rosa Islands (Factors A and E);
2. The removal of all non-native mammals from Santa Cruz Island (Factors A and C); and
3. Installing deer exclusion fencing around many occurrences of *Helianthemum greenei* on Santa Catalina Island (Factors A, C, and E).

As described in the Five Factor Analysis section of this review, Factors B and D are not considered threats to the species at this time

IV. SYNTHESIS

At the time of listing, two mechanisms, topsoil loss and predation, both caused by non-native mammals, were the primary reasons described for the decline of *Helianthemum greenei*. On Santa Cruz Island, the removal of non-native mammals eliminated the threat of predation and ameliorated the loss of top-soil; however, competition with non-native plants has become an additional threat to the species. On Santa Catalina Island, some of the predation pressure was alleviated with the removal of feral pigs; however, deer and bison remain. Although the sizes of the deer and elk populations on Santa Rosa Island have been reduced since listing, the ongoing impacts to *H. greenei* on that island are largely unchanged. We expect the removal of deer and elk from Santa Rosa Island to be completed in 2011.

At the time of listing, the species was thought to be extirpated from Santa Rosa and San Miguel Islands, and extant in 14 occurrences on Santa Cruz Island and 1 occurrences on Santa Catalina Island. Since then, 6 extant occurrences have been discovered on Santa Rosa Island inside three grazing exclosures (South Point, Sierra Pablo, and Black Mountain). Since listing, the number of known occurrences on Santa Cruz Island has increased to 62, and the number of occurrences on Santa Catalina Island has increased to 19. The occurrences on Santa Cruz Island are widely

dispersed across the island, while the distribution of occurrences on Santa Catalina and Santa Rosa Islands is restricted. The number of *Helianthemum greenei* occurrences has increased from 15 to 87 since listing among the three islands known to support the species. As a result, the number of known individuals across the species' geographic range increased to approximately 3,000 to 8,000.

Since the time of listing, our knowledge of the species' relationship to fire has improved dramatically. Land managers have recorded large increases in the number and size of occurrences as a result of fire events. This has positive implications for the future management and recovery of the species.

The number and size of many occurrences of *Helianthemum greenei* has increased substantially since the time of listing and the primary threats to the species are reduced, though they have not been eliminated on Santa Catalina and Santa Rosa Islands. The species is vulnerable to stochastic events and competition from non-native plants, and the narrow distribution on Santa Catalina and Santa Rosa Islands may pose new challenges for recovery. Though the magnitude of threat is reduced, we believe *H. greenei* still meets the definition of threatened, and recommend no change in the listing status at this time.

V. RESULTS

Recommended Listing Action:

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

New Recovery Priority Number and Brief Rationale: We recommend a change in the recovery priority number to 14. This indicates that *Helianthemum greenei* is a species with a low degree of threat and a high recovery potential. Impacts from nonnative mammals have been reduced and the number and size of occurrences have greatly increased on three of the four islands since listing.

VI. RECOMMENDATIONS FOR ACTIONS OVER THE NEXT 5 YEARS

1. We recommend revising the recovery criterion to include maintenance of existing occurrences on Santa Rosa Island. Because we do not know the historic distribution and abundance of the species on Santa Rosa Island, we would first need to establish a baseline for the species over the first 10 years after non-native mammal removal.

2. We recommend managing the habitat throughout the geographic range of *Helianthemum greenei* to conserve and replenish topsoil. This should include (1) removal of bison, deer, and elk, and (2) revegetation efforts.
3. We recommend eliminating non-native predation pressure on *Helianthemum greenei*. Ideally this means removing all non-native herbivorous mammals from Santa Catalina and Santa Rosa Islands. In the interim, reinforced fencing may serve to maintain existing occurrences that can repopulate the islands as predation pressure is reduced.
4. We recommend that land managers expand the distribution of the species by establishing fence-protected occurrences on the west end of Santa Catalina Island, by establishing occurrences inside any other currently fenced *Arctostaphylos confertiflora* occurrences on Santa Rosa Island, and by reestablishing the species on San Miguel Island.
5. We recommend that land managers experiment with controlled burns as a means of increasing the size and number of occurrences of the species, within a framework of restoring ecosystem health.
6. We recommend land managers continue monitoring all known occurrences of *Helianthemum greenei*.

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Figure 2. Occurrences of *Helianthemum greenei* on Santa Cruz Island (McEachern et. al. 2008). The red line is the boundary between TNC (West side) and NPS (East side) properties.

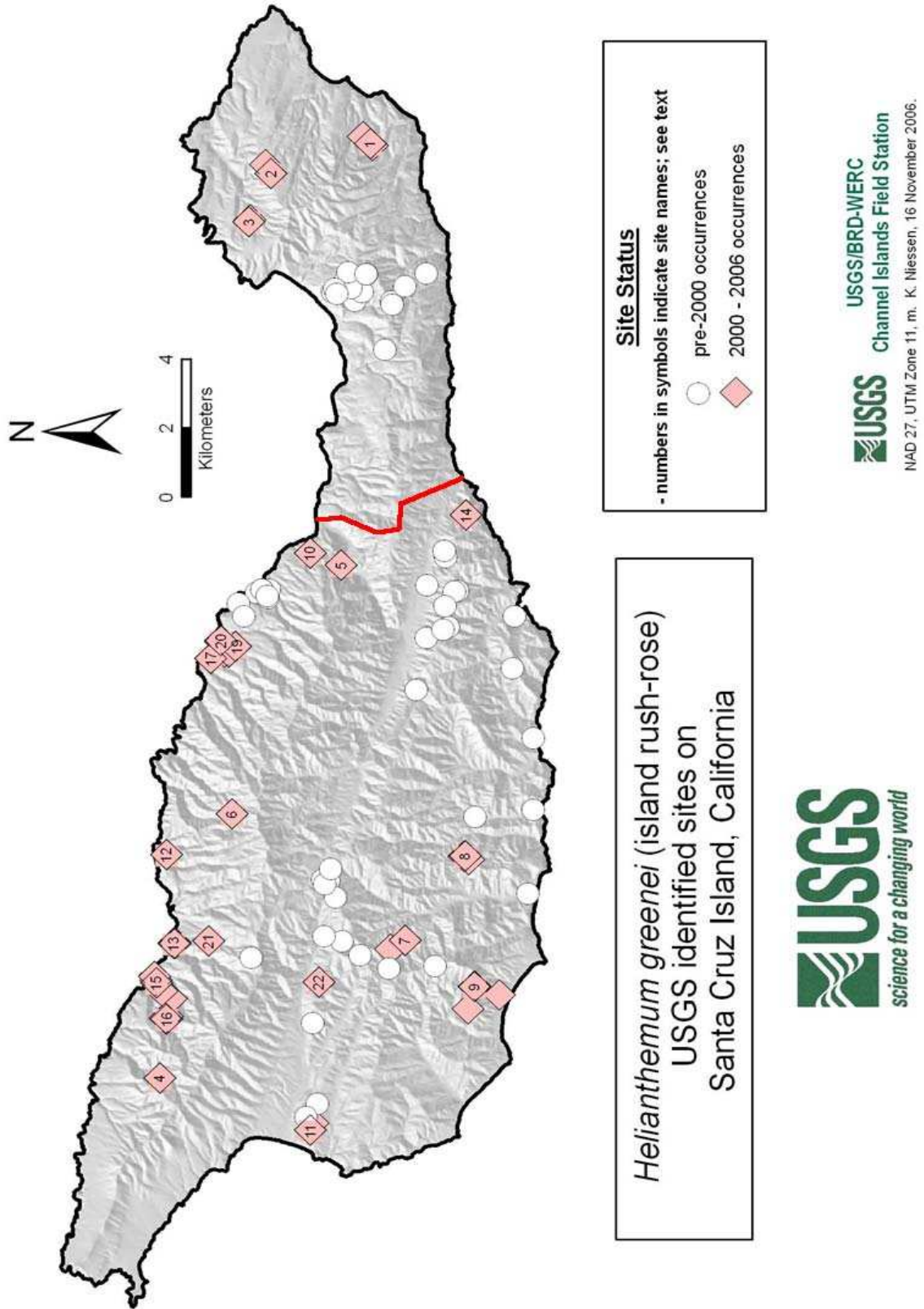


Figure 3. Occurrences of *Helianthemum greenei* on Santa Catalina Island. Small red dots are extant occurrences, large blue dots are historical. The yellow line is the boundary of recent wildfires, and the olive lines are fences erected during pig eradication (Ratay *in litt.* 2009).

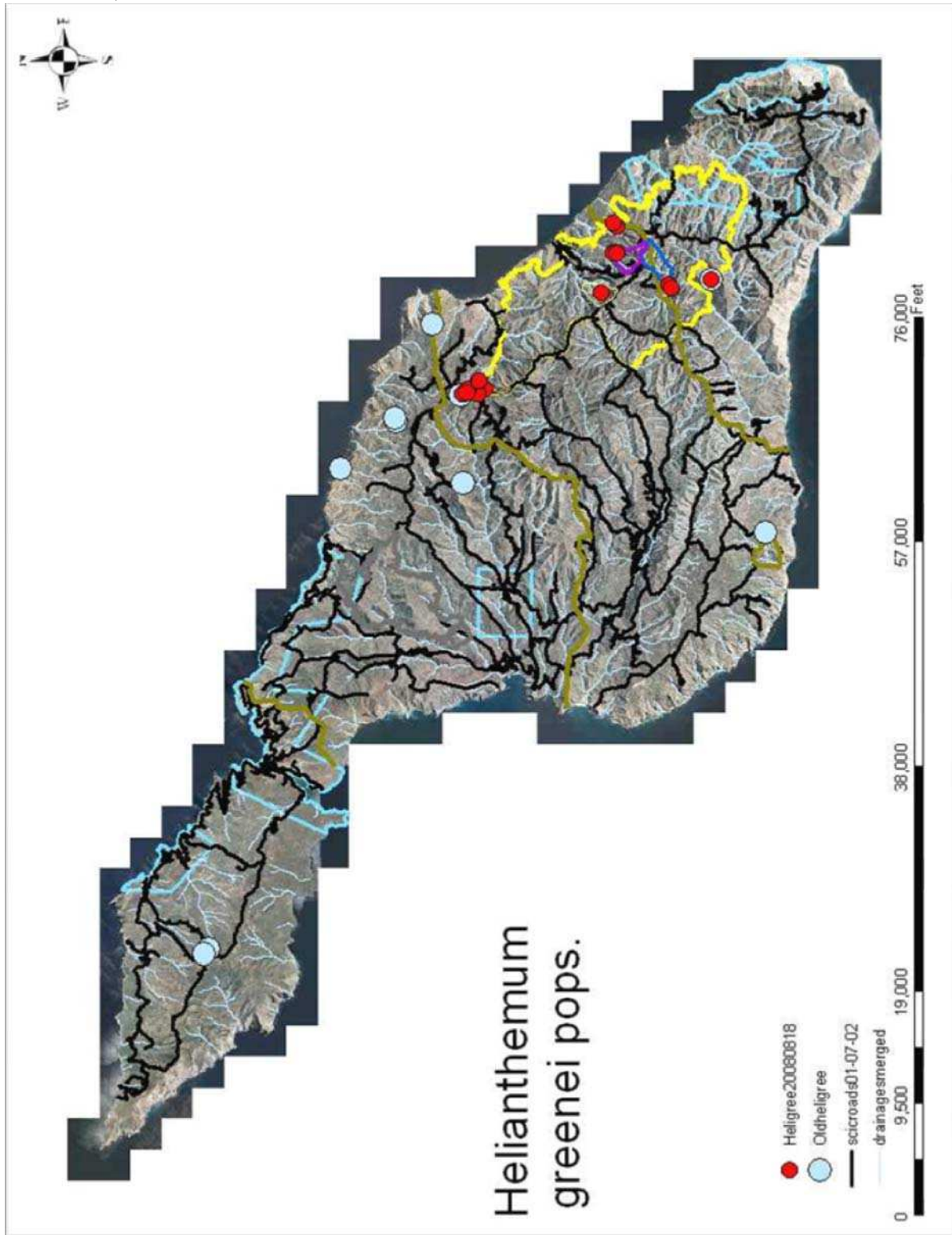
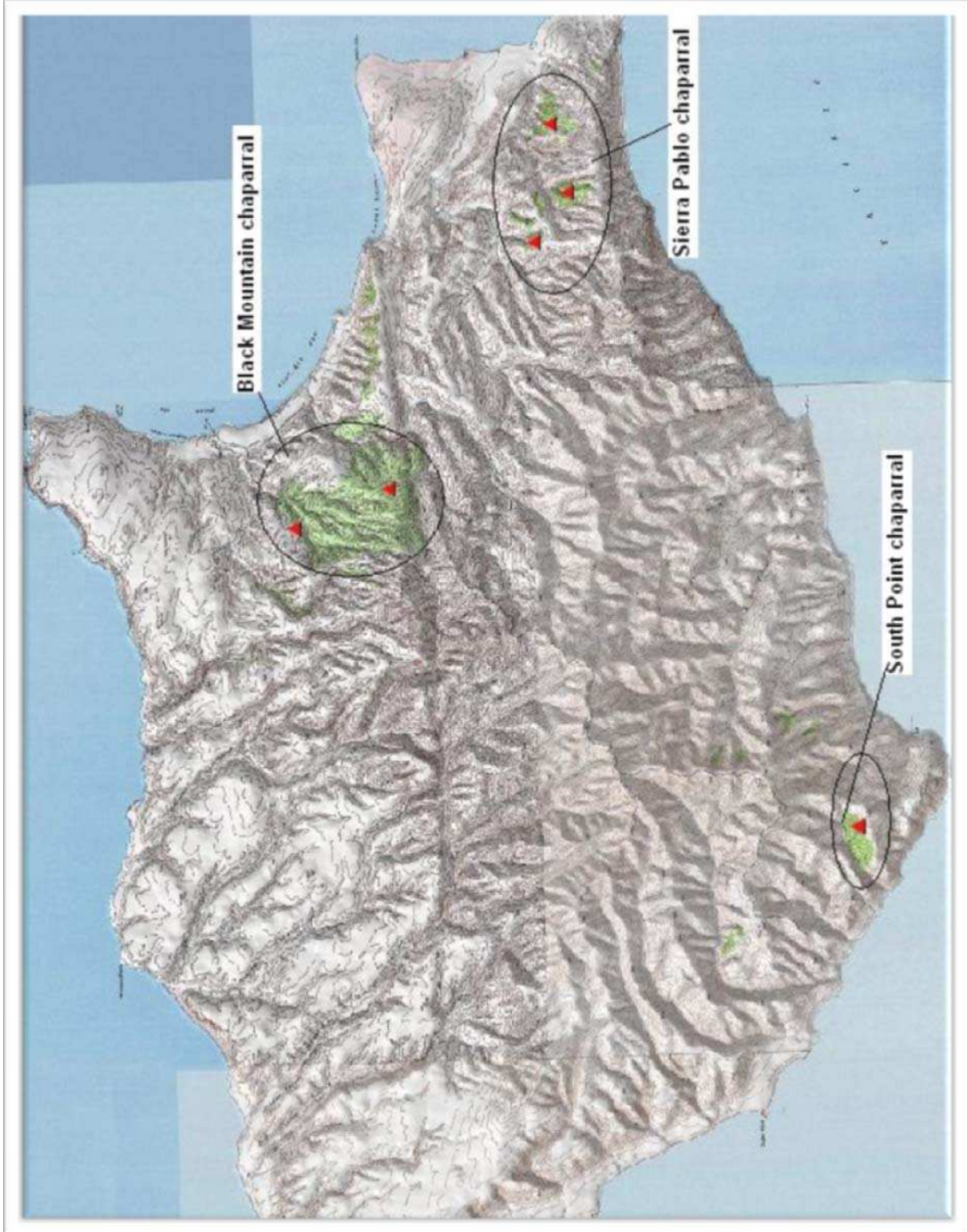


Figure 4. Occurrences of *Helianthemum greenei* on Santa Rosa Island. The South Point, and likely the Sierra Pablo, occurrences are no longer extant above ground (McEachern *in litt* 2009).



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

Helianthemum greenii (island rush-rose)

Current Classification:

Threatened

Recommendation Resulting from the 5-Year Review:

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

Review Conducted By: David A. Simmons

FIELD OFFICE APPROVAL:

Lead Field Supervisor, U.S. Fish and Wildlife Service

Approve Diane K. Wink Date 6/23/10

Cooperating Field Supervisor, U.S. Fish and Wildlife Service

ACTING

Approve [Signature] Date JUN 04 2010

Scott A. Sobiech